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OCS Study
MMS 88-0080

North Slope Subsistence Study
Barrow 1987

Social and Economic Studies

U.S. Department of the Interior
MMS Minerals Management Service
Alaska Outer Continental Shelf Region

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COMPLETED

MMS STUDY
MS 88-0080

Technical Report No. 133

CONTRACT NO. 14-12-0001-30284

Final Technical Report

NORTH SLOPE SUBSISTENCE STUDY
BARROW, 1987

Submitted To

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region
Anchorage, Alaska

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with

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December 1988

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Alaska OCS Environmental Studies Program

North Slope Subsistence Study - Barrow, 1987

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ACKNOWLEDGEMENTS

First and foremost, we wish to extend our thanks to the study households who have shared so willingly their time on this project. Without their voluntary cooperation a study of this nature would be impossible.

We also recognize the important contributions of Ernest S. Burch, Jr. and Sam Stoker to the original design of the study. Dr. Burch was instrumental in sensitizing the study team to the importance of data collection throughout the study period. Mr. Stoker provided valuable insights on field measurements.

Several Barrow residents served as research assistants on the project. Their interest in the project was critical to the successful collection of the subsistence data presented in this report. Specifically we would like to thank Mary Jane Brower, Cheryl Brower, Nilda Brower, and Tommy Pikok, Jr. Thanks also go to Lloyd Nageak who served as translator and interpreter on many occasions.

We are also extremely grateful for the technical as well as financial assistance provided by the North Slope Borough (NSB). Specifically, we would like to thank Mayor George Ahmaogak, Arnold Brower Jr., and Tony Kestler from the Mayor's Office; Karla Kolash, Leona Okakok, David Libby, Dorothy Edwardsen, George Dickison, Bart Asogeak, Sharon Rudolph and Emily Binnian in the Planning Department; and Ben Nageak, Tom Albert, Charlie Brower, Craig George, Geoff Carroll, Mike Philo, and Billy Adams from the Department of Wildlife Management.

We would like to thank the personnel at the Alaska Eskimo Whaling Commission. We also greatly appreciate the vote of support by the Barrow Whaling Captains Association and by the Barrow City Council. The study has benefitted from the insights of John Trent of the Alaska Department of Fish & Game. A special thanks as well to Simeon Patkotak, Sr., Barrow whaling captain, for his participation in one of our locally-aired public information television programs. Finally, we would like to thank those members of the Minerals Management Service who have provided technical and administrative assistance: Fred King, Kevin Banks, Harry Luton and Don Callaway.

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS . . . . . i iii

TABLE OF CONTENTS . . . . . iii v

LIST OF MAPS . . . . . iv vi

LIST OF TABLES . . . . . iv vi

LIST OF FIGURES . . . . . v vii

I. INTRODUCTION 1
  - Purpose of the Project 1
  - Study Approach 1
  - The Study Area 2
  - Format of this Report 4

II. SUBSISTENCE OVERVIEW 5
  - Basis of Harvest Estimates 5
  - Harvest Estimates for Major Resource Categories 9
  - Areal Extent of Subsistence Land Use 15

III. LOCALLY HARVESTED RENEWABLE RESOURCES 20
  - Species Recorded in Year One 20
  - Major Species Groups Harvested by Month 24
  - The Seasonal Round 24
  - Marine Mammals 37
  - Terrestrial Mammals 49
  - Fish 59
  - Birds 71
  - Other Resources 77

REFERENCES CITED 81

APPENDIX: METHODOLOGY A-1
  - Goals and Objectives of the Study A-1
  - The Sampling Strategy A-1
    - Households as the Sampling Unit A-1
    - Selecting the Sample A-2
    - Reliability of the Barrow Sample Results A-7
  - Data Collection and Data Processing A-10
    - Data Collection Methods A-11
      - Key Informant Discussions A-11
      - Participant Observation A-14
    - Data Coding and Processing A-14
      - The Household A-15
      - The Harvest Activity A-15
      - Recording Units A-16
        - Harvest Activity Sheet A-17
        - Data Processing A-24
      - Conversions from Numbers to Pounds A-26
  - References Cited A-34

✓

LIST OF MAPS

Map 1: The Study Area 3
Map 2: Subsistence Harvest Sites, 1987 - 1988 16
Map 3: Subsistence Harvest Sites by Major Resource Category 17
Map 4: Marine Mammal Harvest Sites - All Species 45
Map 5: Marine Mammal Harvest Sites by Species 47
Map 6: Marine Mammal Harvest Sites by Season 48
Map 7: Terrestrial Mammal Harvest Sites - All Species 56
Map 8: Terrestrial Mammal Harvest Sites by Species (Excluding Caribou) 57
Map 9: Caribou Harvest Sites by Season 58
Map 10: Fish Harvest Sites - All Species 69
Map 11: Fish Harvest Sites By Species Groups 70
Map 12: Bird Harvest Sites - All Species 78
Map 13: Bird Harvest Sites by Species 79

LIST OF TABLES

Table 1: Sampling Characteristics - Barrow, Year One 7
Table 2: Comparison of Study Sample Demographic Features to Worl & Smythe (1986) 9
Table 3: Total Harvest Estimates by Major Resource Category - All Barrow Households, Year One 10
Table 4: Total Harvest Estimates - Barrow Native Households, Year One 14
Table 5: Species Harvested by Barrow Study Sample, April 1987 - March 1988 21
Table 6: Monthly Harvests by Major Resource Category - All Barrow Households, Year One 26
Table 7: Harvest Estimates for Marine Mammals - All Barrow Households, Year One 39
Table 8: Marine Mammal Harvest by Species and Month - Barrow, Year One (Pounds of Edible Resource Product) 43
Table 9: Marine Mammal Harvest by Species and Month - Barrow, Year One (Number Harvested) 44
Table 10: Harvest Estimates for Terrestrial Mammals - All Barrow Households, Year One 50
Table 11: Terrestrial Mammal Harvest by Species and Month - Barrow, Year One (Pounds of Edible Resource Product) 53
Table 12: Terrestrial Mammal Harvest by Species and Month - Barrow, Year One (Number Harvested) 54
Table 13: Harvest Estimates for Fish - All Barrow Households, Year One 60
Table 14: Fish Harvest by Species and Month - Barrow, Year One (Pounds of Edible Resource Product) 64
Table 15: Fish Harvest by Species and Month - Barrow, Year One (Number Harvested) 66
Table 16: Harvest Estimates for Birds - All Barrow Households, Year One 73
Table 17: Bird Harvest by Species and Month - Barrow, Year One (Pounds of Edible Resource Product) 75
Table 18: Bird Harvest by Species and Month - Barrow, Year One (Number Harvested) 76
Table A-1: Summary of Sample Design - Barrow, Year One A-6
Table A-2: Total Harvest Estimates by Major Resource Category - All Barrow Households, Year One A-8
Table A-3: Barrow Species Coding List A-20
Table A-4: Conversion Factors A-27
Table A-5: 1987 Barrow Bowhead Whale Harvest - Estimated Total Edible Pounds Per Whale A-29

LIST OF FIGURES

Figure 1: Harvest Amounts by Major Resource Category - All Barrow Households, Year One 13
Figure 2: Monthly Harvest by Major Resource Category - All Barrow Households, Year One 25
Figure 3: Harvest of Marine Mammals - All Barrow Households, Year One . . 38
Figure 4: Monthly Harvest of Marine Mammals - All Barrow Households, Year One 42
Figure 5: Harvest of Terrestrial Mammals - All Barrow Households Year One 51
Figure 6: Monthly Harvest of Terrestrial Mammals - All Barrow Households, Year One 52
Figure 7: Harvest of Fish - All Barrow Households, Year One 62
Figure 8: Monthly Harvest of Fish - All Barrow Households, Year One . . 63
Figure 9: Harvest of Birds - All Barrow Households, Year One 72
Figure 10: Monthly Harvest of Birds - All Barrow Households, Year One . . 74

Figure A-1: Harvest Activity Sheet A-18
Figure A-2: Summary of Data Processing A-25

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INTRODUCTION

The North Slope Subsistence Study, sponsored by the Minerals Management Service (MMS), is a three year study of Barrow and Wainwright residents' subsistence harvests. The major focus of the study is to collect harvest and location data for species used in these communities in a manner that accurately represents total community harvests. This report is the first of three annual reports on the findings of the Barrow research. The first year of Barrow data collection began on April 1, 1987 and continued through March 31, 1988. Throughout the report, this time period is referred to as "Year One."

PURPOSE OF THE PROJECT

When completed, this study will describe community subsistence harvest data and the extent both offshore and onshore areas were used by Barrow and Wainwright residents during the study period. This report specifically presents results from the first year of data collection in Barrow.

STUDY APPROACH

Essential to the study approach is the multi-year nature of the data collection effort. Two aspects of subsistence harvest patterns demonstrate the importance of this long-term approach. First, the areas used by Iñupiat hunters vary seasonally according to resource distribution patterns and hunter access. Second, harvest patterns vary from year to year due to environmental conditions, the population status of the targeted resources, as well as social, economic, and cultural influences.

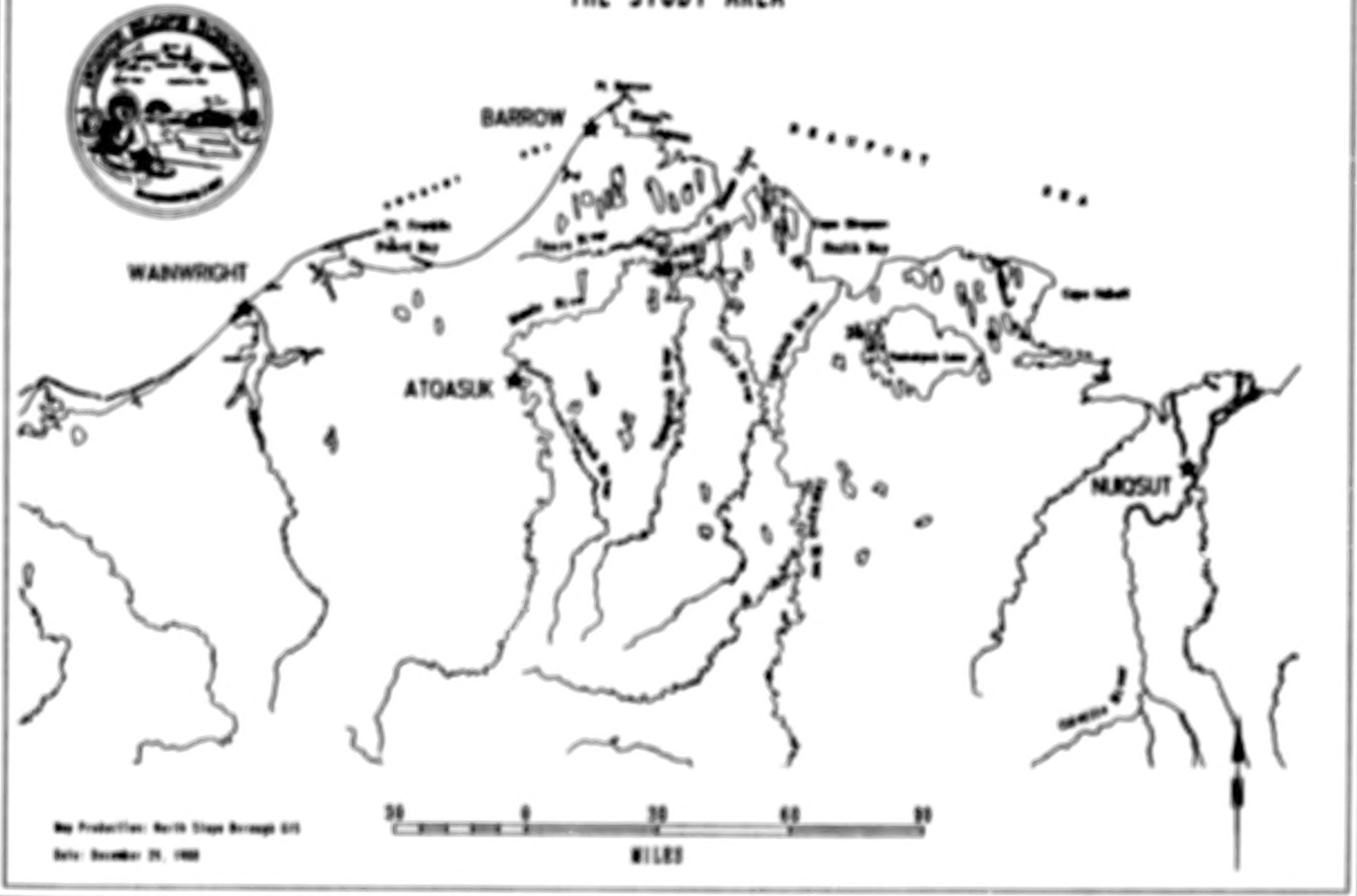
A second essential element of the study approach in Barrow is the application of stratified sampling techniques to increase the representation of active hunters within the sample while ensuring that study results are representative of the community as a whole. Subsistence harvest patterns differ among families within the same community due to varying socioeconomic circumstances, the location of fixed camps, and the experience and knowledge of family members. The stratified sampling approach employed in this study captures most of the variation in harvest patterns by including a majority of the households that account for most of the community's harvest.

THE STUDY AREA

The community of Barrow is situated on the Chukchi sea coast approximately 7.5 miles southwest of Point Barrow, the most northerly point in the United States (Map 1). In 1985 Barrow's population of 3,016 people lived in 935 households (Worl and Smythe 1986). The unique marine environment near Barrow provides local residents with excellent hunting opportunities for most of the mammals, birds, and fish that inhabit or migrate through the Arctic region. The mixing of the Chukchi Sea and Beaufort Sea currents in the vicinity of the Point result in areas of open water throughout the year, ensuring year-round hunter access to ringed seals. Beginning in March or April, a channel of open water (an open lead) forms within three to 10 miles from shore. Local residents hunt in this marine "river" rich in migrating resources including bowhead whales, bearded seals, and eiders. During the arctic summer, onshore winds periodically bring the moving pack ice and the associated walrus, bearded seals and ringed seals to within hunting range of Barrow residents.

Hunters travel along the coast in either direction from Barrow, traditionally hunting as far as Wainwright to the west and the Colville River to the east. In 1988 Barrow residents' coastal cabins and camp sites were situated westerly to Peard Bay and easterly to Cape Simpson, Smith Bay, and the Teshekpuk Lake area. Barrow residents also travel extensively to inland camps and other traditional hunting and fishing sites. Four major rivers and numerous streams and lakes can be reached within four to eight hours by boat or snowmachine and provide access to the inland fish, caribou, bird and plant resources. For example, the Meade River is a four hour snowmachine ride from Barrow. Peard Bay, Atqasuk, the central portion of the Chipp and Ikpikpuk rivers, and Teshekpuk Lake can all be reached from Barrow in less than a day's ride. Seasonal conditions can drastically alter travel times and an intimate knowledge of the environment is required to successfully exploit the inland

MAP 1
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
THE STUDY AREA



Map Production: North Slope Borough GIS

Date: December [illegible]

areas. The most experienced travelers range inland to the headwaters of the Meade and Ikpikpuk rivers during the winter months in search of furbearers inhabiting the more mountainous terrain.

FORMAT OF THIS REPORT

The purpose of this Year One report is to present the subsistence harvest data collected for Barrow during the first year of fieldwork. Following this introduction, the second section of the report (Subsistence Overview) summarizes Barrow harvest activities, including community and household harvest levels and land use patterns for the major resource categories. The third section (Locally Harvested Renewable Resources) presents the Year One harvest data for each major species or species group. The methodology for the Year One data collection, found in the appendix, discusses the study team's sampling strategy and data collection methods.

SUBSISTENCE OVERVIEW

The study findings for Year One (April 1, 1987 through March 31, 1988) are summarized in this section. A discussion of the basis for the harvest estimates along with some demographic information are followed by presentation (in tabular, figure and map form) of the harvest estimates and the areal extent of subsistence land use by study households for the major subsistence resource categories.

BASIS OF HARVEST ESTIMATES

Ideally, a study of this nature would observe the resource harvest activities of every village resident. This approach was not practical in Barrow, the home of 3,016 people in 1985 (Worl and Smythe 1986). Instead, the study team is tracking the harvest activities of a sample of 118 households that statistically represent all households in Barrow.

The sample of 118 Barrow households was selected from all houses in the community. The chance each household had of being selected varied. To ensure that study results are as reliable as possible, the study team assigned each Barrow household to one of seven sampling groups (strata) based on its level of subsistence harvest activity as reported in the North Slope Borough's (NSB) 1985 community census. The study team then varied the chances of selection for the sample based on the household's level of harvest activity. Forty-three of the 48 households containing whaling captains and other highly active harvesters (stratum one) were included in the final sample (i.e., they had a 90 percent chance of being included in the final sample). Households reporting that virtually all their food came from hunting, fishing, and gathering (stratum two) had one chance in three of being included in the final sample. Households reporting that none of their food came from subsistence activities (stratum six) had only one chance in 60 of being included in the final sample. (See Table A-1 in the appendix).

Table 1 summarizes the characteristics of the Barrow sample. The final sampling fraction (i.e., the chance a household had of being included in the final sample) for each stratum appears as the first row of data. The total number of households in each sample group appears in the second row of data. Thus, for example, 48 households were assigned to stratum one. The numbers of households in the sample drawn from each stratum are displayed in the third row of data. Forty-three of the 118 sample households were drawn from the most active harvest group while only six sample households were drawn from stratum six, the least active group. (Households for which no harvest reports were available were assigned to stratum seven.)

A comparison of rows four and five in Table 1 shows that stratum one represents only five percent of all Barrow households but constitutes 36 percent of the Barrow sample. These comparisons highlight the extent to which the chances of selection varied among sample strata. The effectiveness of this sampling approach can be compared with the simpler approach of assigning all households the same probability of selection. Comparing the ratio of the variance in total pounds harvested observed in the stratified sample employed in Year One in Barrow to the variance that would have been obtained with a simple random sample of households, the study sample design achieved a 38 percent lower variance than a simple random sample (calculated according to formula 3.4.6 in Kish 1967:86). Sampling error estimates vary in direct proportion to the square root of the variance, and the lower variance achieved with the stratified sample means that harvest estimates are 21 percent more reliable than they would have been if a simple random sample had been drawn.

Although the sample design yields more reliable results than a comparably sized simple random sample, the results are still subject to sampling error. That is, the community harvest amounts for each species are estimates that vary somewhat according to the specific households that happened to be selected. Although it is not possible to tell exactly what the actual community harvest amounts are from a single sample of households, it is possible to calculate the range of possible sampling errors. This range, or confidence interval, differs for each type of harvest. Confidence intervals are reported with all harvest estimate tables in this report.

TABLE 1: SAMPLING CHARACTERISTICS - BARROW, YEAR ONE

SAMPLE CHARACTERISTIC	SAMPLING STRATA (1)							
	1	2	3	4	5	6	7	TOTALS
Sampling Fraction (2)	0.90	0.36	0.19	0.13	0.06	0.02	0.14	
Households in Community (3)	48	45	67	85	222	360	110	937
Households in Sample (4)	43	16	13	11	14	6	15	118
Percent of all Hsehlds (5)	5%	5%	7%	9%	24%	38%	12%	100%
Percent of sample HH's (6)	36%	14%	11%	9%	12%	5%	13%	100%

---

(1) Households were assigned to sample strata based on their level of subsistence activity, with stratum 1 being the highest level subsistence of use and stratum 6 the lowest (stratum 7 represents households with an unknown use level). Households in strata associated with a high level of activity had a greater chance of selection.

(2) Represents the probability of inclusion in the final sample for each sampling stratum (e.g., of the 48 Barrow households assigned to stratum 1, 43 households, or 90 percent, were included in the final sample).

(3) The total number of Barrow households in each sampling stratum.

(4) The number of Barrow households in the study sample for each sampling stratum.

(5) The number of households in the community for each sampling stratum divided by the total number of Barrow households (e.g., 48 households in stratum 1 divided by 937 total Barrow households).

(6) The number of households in the study sample for each sampling stratum divided by the total number of households in the study sample (e.g., 43 households in stratum 1 divided by 118 total sample households).

Source: Stephen R. Braund & Associates, 1988

Harvest estimates may also vary from actual harvest amounts due to errors in reporting, errors in recording, and errors introduced with the use of average weights in the conversion of the number harvested to the amount of edible pounds harvested. Errors in reporting were minimized through repeated contacts with respondents over the course of the year (see Key Informant Discussions in the appendix for further detail on the method used to conduct and determine frequency of household contacts). Errors in recording were minimized with application of rules and definitions by trained research assistants and through a review of each report by an on-site field coordinator. Finally, the conversion weights applied are primarily those produced by the Alaska Department of Fish and Game (ADF&G) Division of Subsistence from data collected in Nuiqsut and Kaktovik, both North Slope villages (ADF&G n.d.). These weights were used to aid in comparisons between the data presented in this report and other ADF&G research. The weights are useful for comparing the relative amount of food contributed to the total community harvest by the different resources. These and other sampling issues are discussed in detail in Methodology (see appendix).

The study sample of 118 Barrow households is not representative until it is weighted to take into account the sampling fractions by strata. Based on 89 percent of the sample (those households for which we have demographic data), the 1987 average household size in Barrow is estimated to have been 3.4 persons per household. This partial, weighted sample also indicates that Native households averaged 4.0 persons per household while non-Native households averaged 2.9 persons per household.

As an indication of the representativeness of the Barrow sample, Table 2 compares this study's weighted sample to a non-sample (i.e., 100 percent census) analysis of certain demographic features of the community, namely Worl and Smythe's (1986) analysis of the NSB 1985 census data (the only available household level analysis of that census). The comments that follow discuss important parameters to consider in comparing the two sets of data.

In this Year One report, a Native household in our sample is defined as one in which the head of household and/or spouse is Alaska Native. Worl and Smythe (1986) included in their definition of a "mixed" household instances in which only the children of a household were Native (e.g., foster children under the

Table 2: Comparison of Study Sample Demographic Features to Worl & Smythe (1986)

	1987 Study Sample (Weighted)	1985 Census Analysis Worl & Smythe (1986)
Number of Households:		
Total:	937	935
Native:	482 (51%)	535 (57%)
Mean Household Size:		
Overall:	3.4	3.2
Native:	4.0	3.8
Non-Native:	2.9	2.4

Source: Stephen R. Braund & Associates, 1988

care of a non-Native couple). The data necessary to count the number of such households in 1985 are not readily available. Worl and Smythe's inclusion of such households in the total number of Native households explains at least partially the difference between the 1987 sample estimate of 51 percent Native and the 1985 census count of 57 percent Native.

Taking the different definitions of Native households into account, the comparison of percent of all households classified as Native indicates that the 1987 sample is representative of the entire Barrow population. Comparisons of mean household size figures lead to the same conclusion.

HARVEST ESTIMATES FOR MAJOR RESOURCE CATEGORIES

Table 3 presents Year One subsistence resource harvest estimates for the community of Barrow. Harvest estimates, in total pounds of edible resource product and mean pounds harvested both per household and per capita, are presented for marine mammals, terrestrial mammals, fish, birds, and other

TABLE 3: TOTAL HARVEST ESTIMATES BY MAJOR RESOURCE CATEGORY - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

		COMMUNITY TOTALS		AVERAGE POUNDS HARVESTED				SAMPLING STATISTICS				
RESOURCE	CONVERSION FACTOR (2) (Edible Weight Per Resource in lbs)	NUMBER HARVESTED	EDIBLE POUNDS HARVESTED	PER HOUSEHOLD	PER CAPITA	PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	PERCENT OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	STANDARD DEVIATION (lbs)	SAMPLING ERROR AT 95% (lbs)	LOW ESTIMATE (Mean lbs/ Household)	HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING ERROR AS % OF MEAN
Marine Mammals (3)	n/a	n/a	327,182	349	108.5	54%	35.1%	27	53	296	403	15%
Terrestrial Mammals	n/a	n/a	199,058	212	66.0	33%	26.4%	27	54	159	266	25%
Fish	n/a	n/a	62,895	67	20.9	10%	22.1%	8	16	51	83	23%
Birds	n/a	n/a	19,214	21	6.4	3%	31.2%	5	10	11	30	48%
Other Resources	n/a	n/a	266	0.3	0.1	**	2.9%	0	0	0	1	170%
Total (3)	n/a	n/a	608,525	649	201.8	100%	49.4%	47	92	557	742	14%

---

(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

(3) Bowhead harvest does not contribute to the sampling error for marine mammals since the bowhead harvest is based on a complete count.

** represents less than .1 percent

n/a means not applicable

Source: Stephen R. Braund & Associates, 1988

resources as well as an all-species total. Neither "conversion factor" (column two) nor "number harvested" (column three) apply in Table 3 as each resource category includes more than one dissimilar species (e.g., marine mammals includes bowhead whales, walrus, various seals, and polar bear).

The first data presented are the estimated total edible pounds harvested of each major resource category by Barrow residents (column four). These estimates are calculated by multiplying the mean pounds harvested per household (column five) by the estimated 937 occupied households in Barrow. The average household harvest (column five) reflects the weighted sample mean number of edible pounds harvested by each household in Barrow. Since the sample, once it is weighted to account for the sampling fraction, is representative of the entire community, sample means are also estimates of community-wide mean harvests per household. Column six presents the average pounds harvested per capita for the entire community. Column seven in Table 3 shows the relative contribution of each major harvest category to the total Barrow harvest of subsistence resources. Marine mammals, for example, contribute approximately 54 percent of the total pounds of edible resource product in Barrow, whereas terrestrial mammals contributed 33 percent and fish 10 percent. Column eight presents the percentage of Barrow households that harvest each major resource category. For example, 35 percent of all Barrow households participated in the harvest of marine mammals from April 1, 1987 to March 31, 1988. Over 49 percent participated in the harvest of at least one resource.

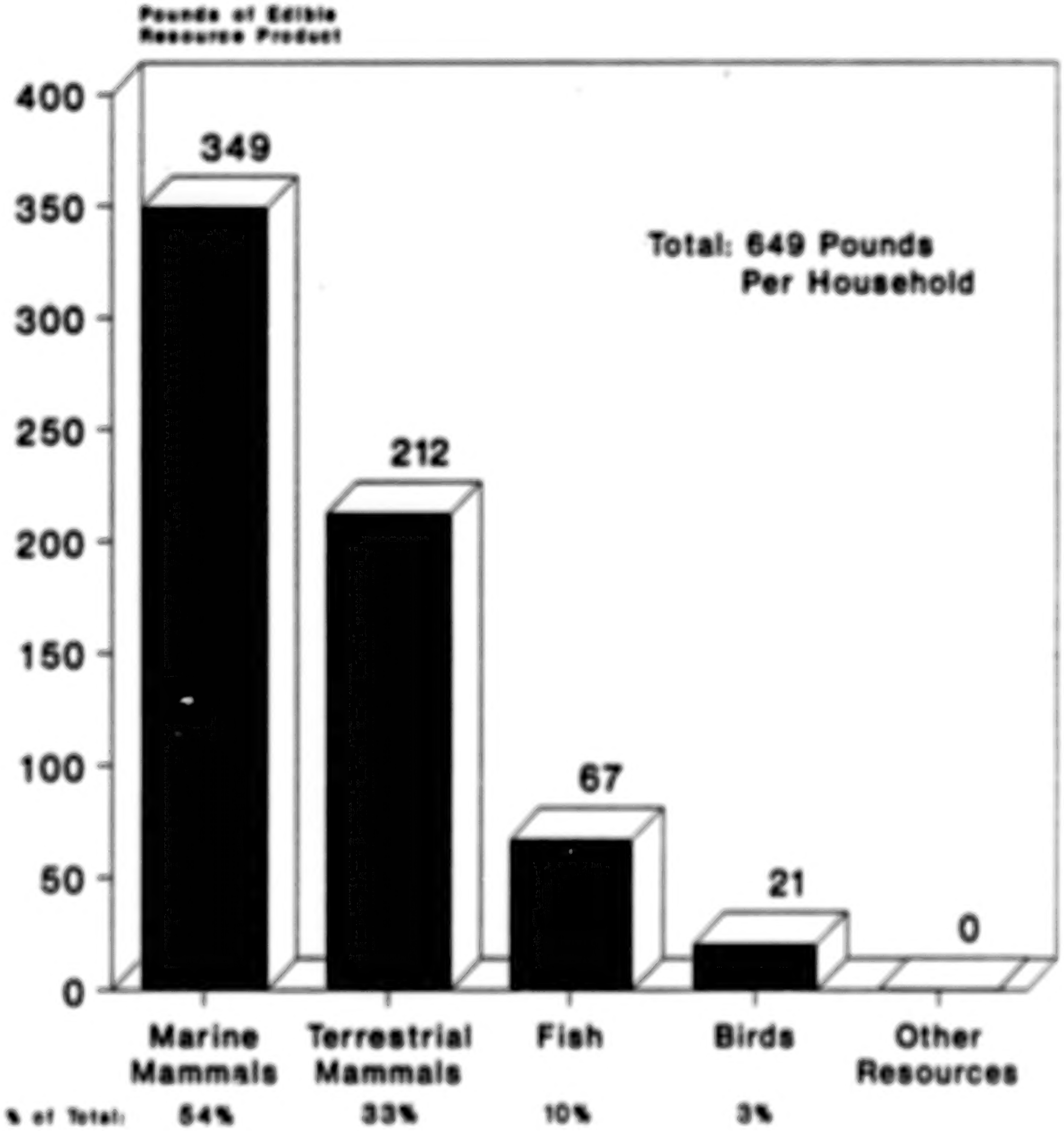
The final columns in Table 3 present sampling statistics. The standard deviation (column nine) is a calculated measure of the variability of household harvests that exists within the sample. This information is used to estimate the sampling error (column ten) which can be interpreted as the maximum variation in the mean household harvest one could expect from one sample to another in repeated replications of this study. The sampling error is then alternatively added to and subtracted from the mean to present a low and a high estimate of the mean harvest per household (columns eleven and twelve). The mean harvest per household is more reliable for some resource categories than others. The last column (column thirteen) reports the sampling error as a percentage of the mean harvest per household (i.e., the sampling error divided by the mean, expressed as a percent). For example, the marine mammal harvest is estimated to be reliable within 15 percent of the reported mean harvest. The reliability of the bird harvest is substantially lower. In this case, the harvest is estimated to be reliable within 48 percent of the mean. The higher the error as a percentage of the mean, the lower the reliability of that estimate.

Figure 1 graphically presents the edible pounds of resource product per household for each of the major resource categories for all Barrow households. Marine mammals accounted for 349 pounds of the 649 edible pounds of subsistence resources harvested per household in Year One. Terrestrial mammals were the second most important resource category (212 edible pounds per household) followed by fish, birds and other resources.

While each of the above estimates represents the mean harvest by Barrow households, three cautions are noteworthy. First, the actual harvest in any given household varies depending on the hunting success, species preference, and the level of harvest activity of household members. Few households may actually harvest the amount exactly equal to the community mean. Second, Figure 1 presents the relative importance of the major species categories in terms of edible pounds harvested per household. It does not necessarily indicate the relative cultural and nutritional importance of the resource categories, nor does it indicate the amount of resources actually consumed or take into account the amount of resources imported or exported. Finally, these data pertain to a single year of harvest activity. While the relative importance of the resource categories may not change, the absolute harvest levels are likely to vary from year to year. Future study reports will incorporate a comparison of annual harvest activity and will report means and totals based on data collected over two or three years.

As stated previously, about half of the Year One households in Barrow were classified Native (i.e., containing a Native head of household or spouse) and about half were non-Native. Whereas 80 percent of the non-Native households did not harvest resources in Year One, only 23 percent of Native households did not harvest resources in Year One. These non-harvesting households do not add to the total pounds of community harvest, but do add to the number of households used to calculate the mean harvest. As a result, the mean harvest estimates are lower for all households in Barrow than they are for Native households. Although the main focus of this report is on the harvest activities of the community of Barrow as a whole, Table 4 presents summary resource harvest totals for Barrow Native households.

Figure 1: Harvest Amounts By
Major Resource Category
All Barrow Households, Year One



(Mean Edible Pounds Per Household)

Source: Stephen R. Braund & Assoc., 1988

TABLE 4: TOTAL HARVEST ESTIMATES - BARROW NATIVE HOUSEHOLDS, YEAR ONE (1)

	WEIGHTED HOUSEHOLD MEAN	
MAJOR RESOURCE CATEGORY	NUMBER HARVESTED PER HOUSEHOLD	EDIBLE LBS. HARVESTED PER HOUSEHOLD
Marine Mammals	n/a	639.18
Terrestrial Mammals	n/a	359.32
Fish	n/a	129.35
Birds	n/a	30.18
Other Resources	n/a	0.06
Total	n/a	1,158.09
MARINE MAMMALS		
Bowhead	0.02	356.23
Seal	0.80	35.75
Bearded Seal	0.46	81.56
Walrus	0.20	159.56
Polar Bear	0.02	8.08
TERRESTRIAL MAMMALS		
Caribou	2.93	342.95
Moose	0.03	16.01
Brown Bear	*	0.23
Dall Sheep	0.00	0.00
Porcupine, Ground Squirrel	0.08	0.13
Fox, Wolverine	0.04	n/a
FISH		
Whitefish	33.88	104.14
Other Freshwater Fish	13.85	23.67
Salmon	0.23	1.38
Other Coastal Fish	0.78	0.14
BIRDS		
Ducks	0.05	0.08
Eider	6.57	9.85
Geese	4.19	18.53
Ptarmigan	2.48	1.72

(1) Based on a sample of 93 Native households weighted to represent 482 Native households in Barrow.

* Less than 0.01.

Source: Stephen R. Braund & Associates, 1988

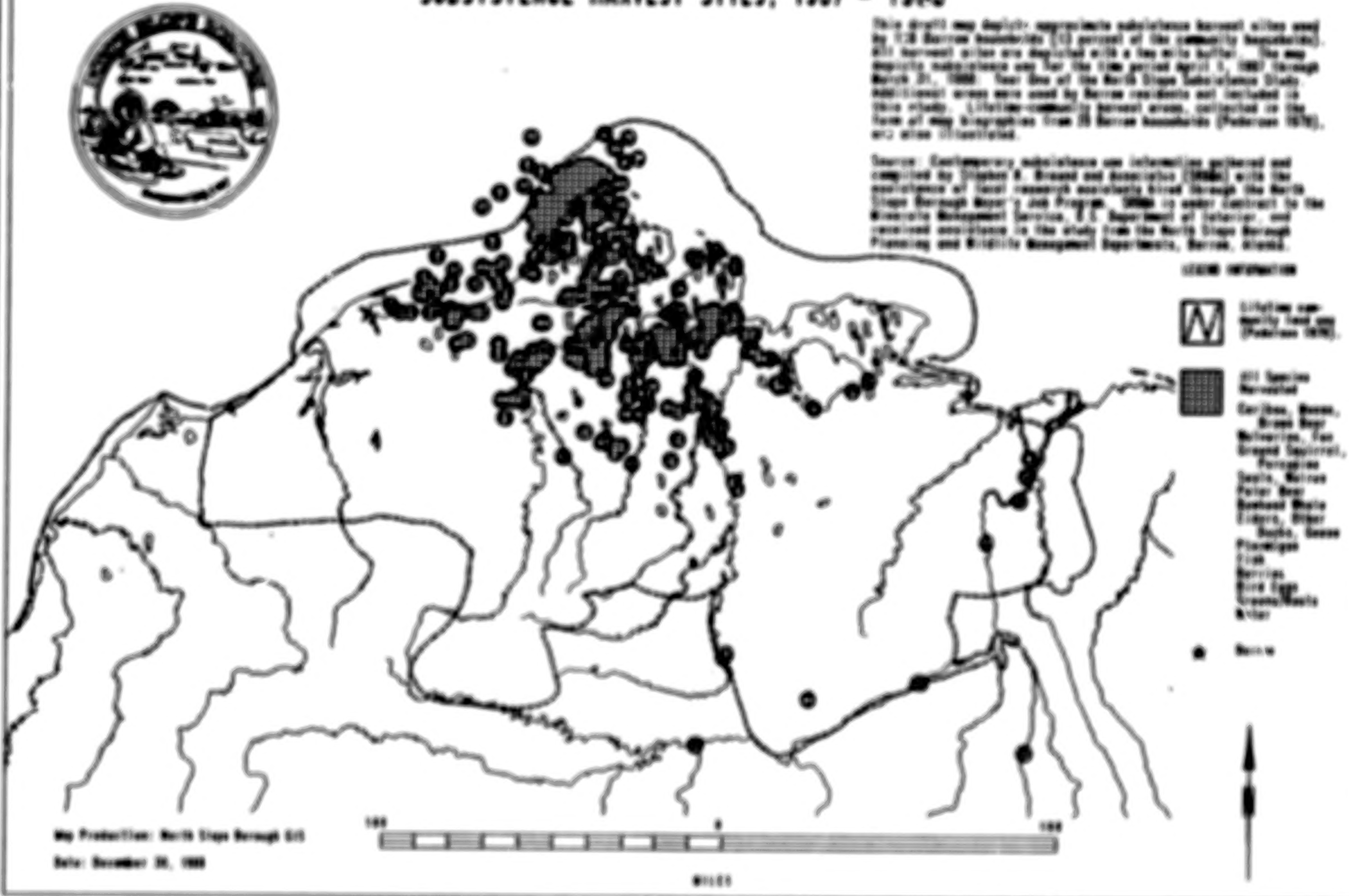
AREAL EXTENT OF SUBSISTENCE LAND USE

Map 2 illustrates the harvest locations of members of the 118 sample households for the harvest of all species during Year One. (The data presented on the maps only include the areas of successful harvests by the sample households in Year One and do not include the total area hunted.) During harvest discussions with study households, the hunter marked on a 1:250,000 scale map the location where each harvest occurred. On most of the maps in this report, individual harvest locations are depicted by a shaded circle. Each circle represents an actual harvest site surrounded by a two mile buffer. Overlapping circles form larger shaded areas.

The two mile buffer serves three purposes. First, the depiction of harvest sites with a two mile buffer reflects an intent to include at least the immediate hunting area. Second, the use of a buffer also accounts for possible errors in reporting the exact location of harvest sites. Respondents reported the location of fish sites, for example, with certainty because those sites were identified easily by the geographic features of the lake or river. Other harvest sites with distinct geographic features were reported with a high degree of accuracy as well, evidenced by the respondent's ease and confidence in mapping the location. Harvests of marine mammals or birds from boats offshore, for example, or of caribou out in the open tundra, were reported typically as an approximate location but recorded as one point on the map representing his best estimate of the exact harvest site. The lack of geographic landmarks reduced the precision with which the hunter could locate his harvest site on a map. Third, the buffer is used to enhance the visual effectiveness of the data presented on the maps, particularly where distinct categories of data must be differentiated. Symbols as well as smaller buffers were tried, but did not represent the data clearly, especially where harvests of multiple species overlapped (e.g., Map 3).

Also illustrated on several of the maps is a dashed line that represents the area used during the lifetime of 20 Barrow harvesters interviewed in the late 1970s. The data were collected for the Cooperative Park Studies Unit at the University of Alaska and the NSB (Pedersen 1979). These perimeter data are included to demonstrate how the area used in a single year (e.g., Year One) is not inclusive of the areas used by community members over time.

MAP 2
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
SUBSISTENCE HARVEST SITES, 1987 - 1988



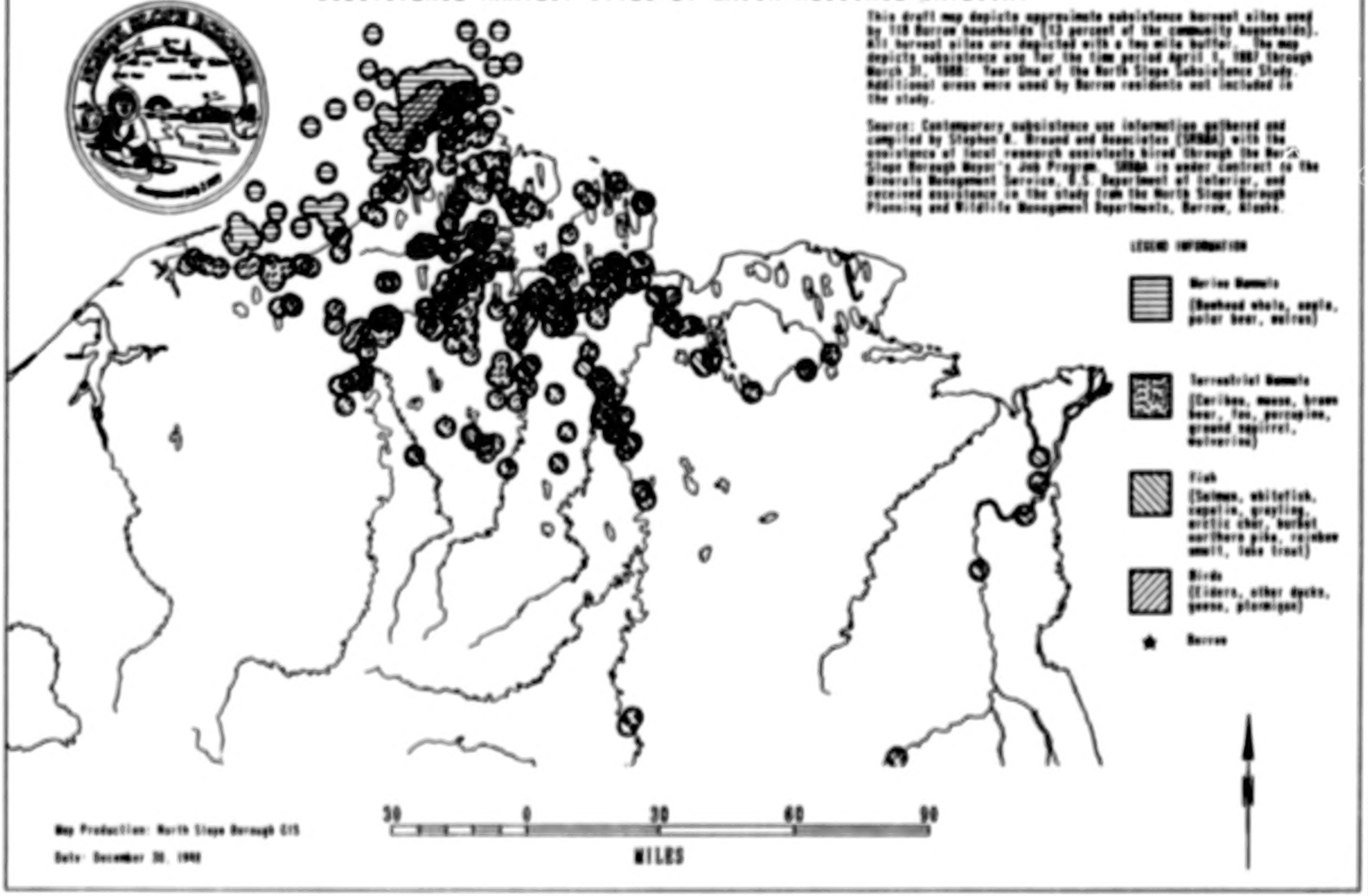
This draft map depicts approximate subsistence harvest sites used by [illegible] Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in this study. Lifetime-community harvest areas, collected in the form of map biographies from [illegible] Barrow households (Pedersen 1979), are also illustrated.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.

Map Production: North Slope Borough GIS

Date: December [illegible], [illegible]

MAP 3
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
SUBSISTENCE HARVEST SITES BY MAJOR RESOURCE CATEGORY


LEGEND INFORMATION
▤ Marine Mammals
(Bowhead whale, seals, polar bear, walrus)
▦ Terrestrial Mammals
(Caribou, moose, brown bear, fox, porcupine, ground squirrel, wolverine)
▧ Fish
(Salmon, whitefish, capelin, grayling, arctic char, burbot, northern pike, rainbow smelt, lake trout)
▨ Birds
(Eiders, other ducks, geese, ptarmigan)
★ Barrow
30
0
30
60
90
MILES
N

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households (13 percent of the community households). All harvest sites are depicted with a two-mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.

Map Production: North Slope Borough GIS

Date: December 30, 1988

Geographic features are not named on Maps 2 through 13 due to the need to present harvest data as cleanly as possible. Geographic features can be identified by consulting Map 1 in combination with the harvest data maps.

All Barrow harvesters do not hunt and fish in the same geographic areas. Barrow residents use some 77 fixed camps for their harvest activities and visit scores of other areas in pursuit of mobile resources (Worl and Smythe 1986). The high degree of geographic dispersion of Barrow residents' hunting and fishing activities suggests that the harvest sites reported by the sample of Barrow residents are unlikely to depict the full range of current harvest areas for the community as a whole. That is to say, while numeric data gathered from the study sample are weighted and considered representative of the entire community (e.g., harvest amounts), the geographic areas presented in the maps represent only those areas used by the unweighted sample of 118 households. It is possible, if not likely, that unsampled households used areas not presented in these data. Field observations affirm that the Year One data on Map 2 can be interpreted as largely representative of the geographic extent of Barrow's Year One general use area (the area encompassing most Year One harvest sites). A complete enumeration of Year One harvest sites for the entire community likely would fill many of the apparent gaps in the Year One generalized harvest area. This Year One generalized harvest area does not include all Year One harvests; some harvests occurred up to 160 miles from Barrow.

These maps currently indicate where one or more harvest events occurred. On most maps, these harvest events pertain to an individual species or species group harvested at that site. A harvest site may represent one harvest event during which one animal was harvested, or it could represent any number and variety of animals harvested on different dates and by different households, all in the same location. Hence, the sites do not represent the number of kills or the pounds of edible resource product harvested at each site.

The major areas where sample households harvested the four major species groups during Year One are shown on Map 3. As a result of the larger scale selected for Map 3 and other detailed maps, a few outlying harvests sites reported during Year One are not shown. Of the maps enlarged to illustrate more clearly the data concentrated in the main harvest areas, only maps 3, 9, and 11 were cropped in a manner that eliminated harvest sites. By comparing Map 3 to Map

2, one sees that the three most southerly sites on Map 2 do not appear on Map 3. These sites represent (from west to east) a moose harvest site, a wolverine harvest site, and a moose and fish harvest site. Map 9 does not show two caribou harvest sites to the east and south of the map boundaries, and Map 11 does not show three fish harvest sites, also to the east and south of the area shown.

The principal focus of marine mammal harvest activity was within about 10 miles of Barrow. Additional harvest areas occurred along the coast southwest of Barrow to Peard Bay. Terrestrial mammal harvest areas (principally caribou) were more widespread, occurring along the coast both southwest and east of Barrow, inland some 30 miles, and near camps located as far south of Barrow as the confluence of the Chipp and Ikpikpuk rivers -- about 100 miles over land. Fish harvest areas were principally along the river systems while bird harvest areas were split between the river systems and the Barrow vicinity.

LOCALLY HARVESTED RENEWABLE RESOURCES

In this portion of the report, Year One harvest data are presented in detail. The first section provides a summary of all species harvested in Year One and is followed by a month by month description of harvest activities in Year One (seasonal round), including factors that influenced the harvest. Following the seasonal round, data for each species and species group are presented by major resource category. The main components of each resource discussion are:

- o Number of animals harvested (by species)
  - o Totals for Year One
  - o Totals by month
- o Number of edible pounds harvested (by species)
  - o Totals for Year One
  - o Totals and percentages by month
  - o Per household averages
  - o Per capita averages
- o Percentage of total pounds harvested
- o Percentage of Barrow households harvesting the resource

Tables and figures are used extensively to summarize the data, while the computer generated maps of the study sample's data illustrate harvest ranges for each major resource category and for species or species groups within the category.

SPECIES RECORDED IN YEAR ONE

All harvested species recorded by this study in Year One are displayed in Table 5. The list includes over 40 individual species of mammals, fish, birds, and plant materials harvested by the study households. In addition to mammals, fish, birds and plants, Barrow sample households also harvested several kinds of bird eggs, ice, snow, and water. It is possible that Barrow residents who were not included in the study harvested additional resources during Year One. Wolf, beluga whale, ribbon seal, and arctic cod are good examples of resources

TABLE 5: SPECIES HARVESTED BY BARROW STUDY SAMPLE
APRIL 1987 - MARCH 1988

Species	Iñupiaq Name	Scientific Name
Marine Mammals		
Bearded seal	Ugruk	Erignathus barbatus
Ringed seal	Natchiq	Phoca hispida
Spotted seal	Qasigiaq	Phoca largha
Bowhead whale	Aġviq	Balaena mysticetus
Polar bear	Nanuq	Ursus maritimus
Walrus	Aiviq	Odobenus rosmarus
Terrestrial Mammals		
Caribou	Tuttu	Rangifer tarandus
Moose	Tuttuvak	Alces alces
Brown bear	Akłaq	Ursus arctos
Dall sheep	Imnaiq	Ovis dalli
Arctic fox (Blue)	Tiġiganniaq	Alopex lagopus
Red fox (Cross, Silver)	Kayuqtuq	Vulpes fulva
Porcupine	Qiŋaġluk	Erethizon dorsatum
Ground squirrel	Siksrik	Spermophilus parryii
Wolverine	Qavvik	Gulo gulo
Fish		
Salmon (non-specified)		
Chum salmon	Iqalugruaq	Oncorhynchus keta
Pink (humpback) salmon	Amaqtuq	Oncorhynchus gorbuscha
Silver (coho) salmon	Iqalugruaq	Oncorhynchus kisutch
King (chinook) salmon		Oncorhynchus tshawytscha
Whitefish (non-specified)		Coregonus sp.
Round whitefish	Aanaaliq	Prosopium cylindraceum
Broad whitefish	Aanaaliq	Coregonus nasus
River caught	Aanaaliq	Coregonus nasus
Lake caught	Aanaaliq	Coregonus nasus
Humpback whitefish	Piqutuuq	Coregonus clupeaformis
Least cisco	Iqalusaaq	Coregonus sardinella
Bering, Arctic cisco	Qaaktaq	Coregonus autumnalis
Capelin	Paŋmaksraq	Mallotus villosus
Arctic grayling	Sulukpaugaq	Thymallus arcticus
Arctic char	Iqalukpik	Salvelinus alpinus
Burbot (Ling cod)	Tittaaliq	Lota lota
Northern pike	Siulik	Esox lucius
Rainbow smelt	Iłhuaġniq	Osmerus mordax
Lake trout	Iqalukpik	Salvelinus namaycush

TABLE 5 (cont.): SPECIES HARVESTED BY BARROW STUDY SAMPLE, APRIL 1987 - MARCH 1988

Species	Iñupiaq Name	Scientific Name
Birds		
Eider (non-specified)		
Common eider	Amauligrauq	Somateria mollissima
King eider	Qiŋalik	Somateria spectabilis
Spectacled eider	Tuutalluk	Somateria fischeri
Other Ducks (non-specified)	Qaugak	
Goose (non-specified)	Nigliq	
Brant	Niġliñġaq	Branta bernicla n.
White-fronted goose	Nigliviuk	Anser albifrons
Ptarmigan (non-specified)		Lagopus sp.
Willow ptarmigan	Aqargiq	Lagopus lagopus
Other Resources		
Berries (non-specified)		
Blueberry	Asiaq	Vaccinium uliginosum
Cranberry	Kimmiŋñaq	Vaccinium vitis-idaea
Salmonberry	Aqpik	Rubus spectabilis
Bird Eggs (non-specified)	Mannik	
Eider eggs		
Greens/Roots (non-specified)		
Wild rhubarb	Quŋulliq	Oxyric digyna
Water		
Fresh water	Imiq	
Fresh water ice	Sikutaq	
Sea ice	Siku	

that are usually harvested in a year, but were not harvested in Year One by the sample households nor by other Barrow households, to the best of the study team's knowledge. A complete list of resources known to have been harvested historically by Barrow residents is found in Table A-3 in the appendix.

In some instances, the researchers were not able to record each successful subsistence harvest by individual species. This problem occurred most commonly for those species harvested in mixed groups (e.g., various species of birds or fish). The recording of marine and terrestrial mammals, on the other hand, was more accurate. The harvest of these larger animals was more memorable for most people, and respondents had no problem distinguishing one from the other.

As mentioned above, beluga whale and ribbon seal are notably absent from the list of marine mammals that have been harvested commonly in the past but are not known to have been harvested by any Barrow residents in Year One, despite attempts at harvesting belugas. Wolf and some of the smaller furbearers (e.g., marmot and ermine) are among the terrestrial mammals that Barrow residents often hunt but apparently did not harvest successfully in Year One.

The fish species harvested include essentially all species available to Barrow residents except Arctic cod, tom cod, sculpin, and blackfish. Arctic and Bering cisco are grouped together for this study and, in fact, differentiation of the two is often difficult without dissecting the fish.

A variety of bird species available to Barrow residents were not recorded in Year One. Respondents usually noted duck, eider, and geese harvests at a generic level, e.g., "eiders" or "geese." Further probing sometimes led to a finer level of distinction between species, but often the species breakdown was a best guess. Of the six or more duck species, none was recorded individually, but rather generically as a "duck" harvest. Other unrecorded species included loons, owls, swans, and cranes.

Resources presented in Table 5 in the "other species" category elicited the least specific responses during Year One. Harvest of these species was often forgotten unless the researcher specifically asked about them. Greens, roots and berries were often harvested and consumed while at inland camps.

MAJOR SPECIES GROUPS HARVESTED BY MONTH

Total harvests by month for each of the major resource categories are illustrated in Figure 2. Table 6 provides a month by month accounting of the total edible pounds harvested in each major resource category.

Marine mammal harvests occurred every month during Year One. In terms of total edible pounds, April through August and October were the primary harvest periods. Marine mammal harvests comprised over 75 percent of the total harvest in the four month period April through July.

Terrestrial mammal harvests were recorded for every month except December. The primary harvest period was July through October. During September the harvest of terrestrial mammals far outweighed that of the other resource categories, contributing 74 percent of the total monthly harvest. During February and March the harvest was also high in relation to the other categories, although the total harvests were much lower during those months.

Fish harvests occurred primarily between May and October. The maximum harvests took place in October during fall fishing under the ice. Fish comprised approximately 20 percent of October's total harvest. Thirty-nine percent of all fish harvested in Year One were caught in October.

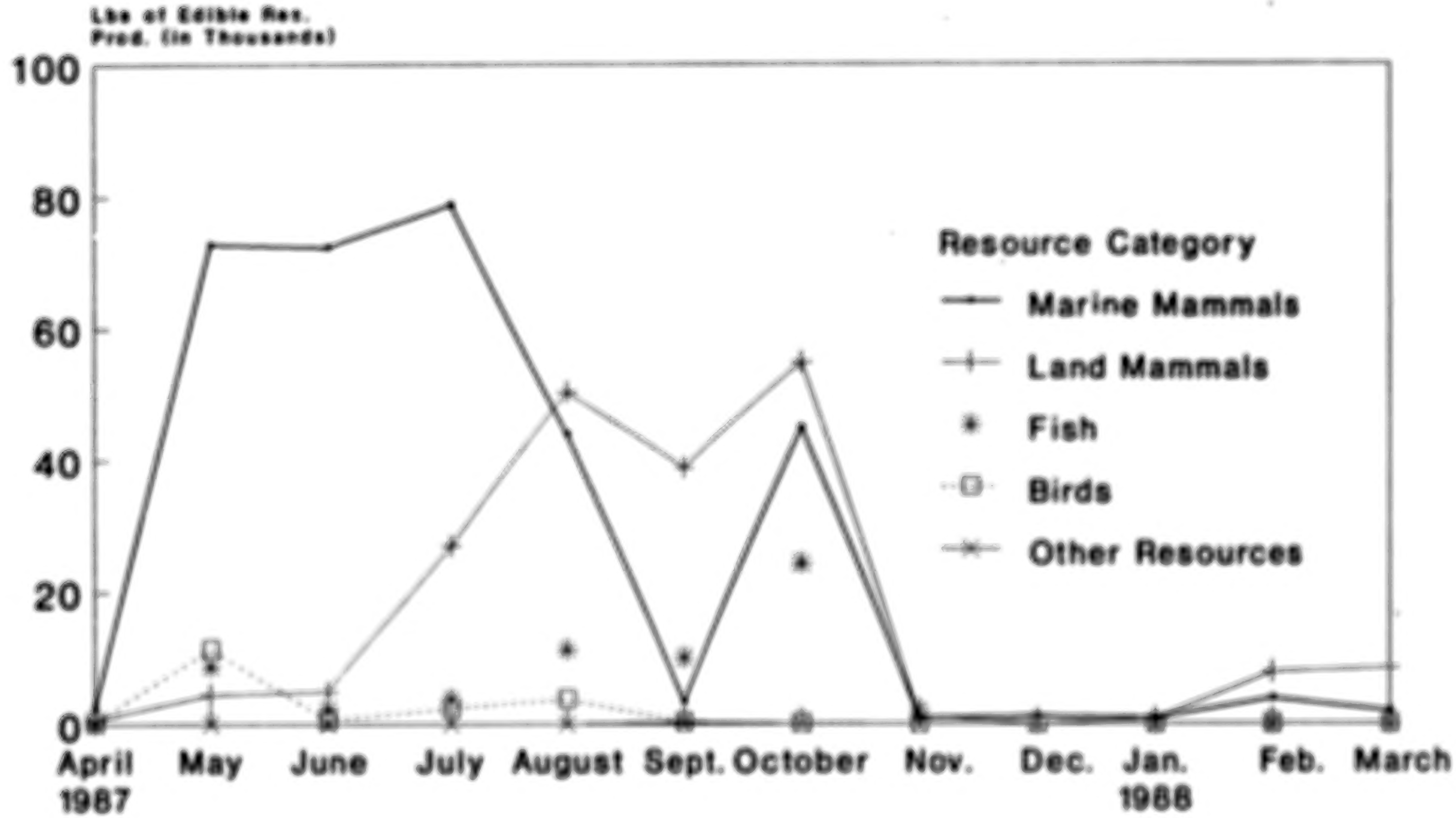
Birds were harvested primarily in April through October with the peak harvest, 60 percent, taking place in May.

Other resources were harvested during the mild months between May and October. The peak harvest was in September.

THE SEASONAL ROUND

The following month by month report of subsistence activities documents Barrow residents' annual subsistence cycle from April 1, 1987 through March 31, 1988. The descriptions for each month have two purposes: first, to generally discuss the month's subsistence activities; and second, to point out any significant or unusual environmental conditions that may have affected hunting that month.

Figure 2: Monthly Harvest by
Major Resource Category
All Barrow Households, Year One



Source: Stephen R. Braund & Assoc., 1988

TABLE 6: MONTHLY HARVESTS BY MAJOR RESOURCE CATEGORY - ALL BARROW HOUSEHOLDS, YEAR ONE
(Pounds of Edible Resource Product)

TOTALS

	1987									1988		
MAJOR RESOURCE CATEGORY	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
Marine Mammals	2,526	72,828	72,304	78,811	43,901	3,232	44,934	842	1,110	854	3,877	1,956
Terrestrial Mammals	653	4,460	4,910	27,004	50,291	38,777	54,833	1,181	0	783	7,782	8,372
Fish	0	8,760	2,390	3,804	11,313	10,064	24,334	2,182	0	0	0	45
Birds	365	11,422	594	2,450	3,746	241	86	0	0	0	0	0
Other Resources	0	2	0	6	19	238	0	0	0	0	0	0
Total	3,543	97,473	80,198	112,075	109,271	52,551	124,185	4,206	1,110	1,638	11,659	10,373

PERCENTS

	1987									1988			
MAJOR RESOURCE CATEGORY	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	
Marine Mammals	1%	22%	22%	24%	13%	1%	14%	0%	0%	0%	1%	1%	= 100%
Terrestrial Mammals	0%	2%	2%	14%	25%	19%	28%	1%	0%	0%	4%	4%	= 100%
Fish	0%	14%	4%	6%	18%	16%	39%	3%	0%	0%	0%	0%	= 100%
Birds	2%	60%	3%	13%	20%	1%	0%	0%	0%	0%	0%	0%	= 100%
Other Resources	0%	1%	0%	2%	7%	90%	0%	0%	0%	0%	0%	0%	= 100%
All Resources Combined	1%	16%	13%	18%	18%	9%	20%	1%	0%	0%	2%	2%	= 100%

Source: Stephen R. Braund & Associates, 1988

APRIL

Preparations for whaling occupied most of Barrow hunters' time this month. Inland caribou hunting trips also occurred. Fresh caribou was an important food for whaling crews. Typically, a whaling captain or crew member traveled to their fish camp during April to deliver fuel and other supplies, retrieve stored caribou and fish, and to harvest a caribou or two during the trip. Crews were out making trails through the pressure ridges near shore during the first week of April. The first whaling crew moved out on the ice April 15. The first bowhead whales moved past Barrow on about April 18. Seal hunters were active along the lead edge until the first crew moved out, at which point the seal hunters refrained from sealing until after the initial bowhead harvest quota was fulfilled. Polar bears were harvested this month by whaling crew members.

The open lead edge was approximately three miles out from shore. Due to southwest winds, the one mile wide lead was blocked by ice floes in front of town after the 15th. Toward the end of the month, the winds switched to the northeast and the lead re-opened in front of town.

MAY

Early May in Barrow was dominated by the annual spring bowhead whale harvest. Barrow whalers harvested three whales with the community's initial quota of nine strikes between May 2 and May 5. A tenth strike was transferred from Savoonga and Barrow whalers harvested a fourth whale on May 17. After the initial four day harvest period, some crews left the ice to prepare for inland waterfowl hunting. The remaining crews (approximately 12) stayed on the ice to wait for additional strikes to be transferred from other whaling villages and to hunt for other marine mammals and eiders.

The first large flocks of eiders flew by Barrow the first week of May. By May 12, families were traveling inland by snowmachine to establish spring hunting camps. Goose hunting continued throughout the month. Families reported encountering a lack of snow inland, causing them to stay closer to town than last year.

During the last week of May the first ugruk (bearded seal) harvests of Year One were reported.

The temperature reached the 30s (F) by mid-month and break-up conditions began in Barrow.

JUNE

According to Barrow residents, adverse weather was influential on their 1987 goose harvests. Conditions did not prevent households from participating in the harvest, but residents attributed lower than expected harvests to high winds, blowing snow, and fog. The more active goose hunters averaged about two weeks in the field. Typically, one household in an extended family would stay at the camp for the entire period, with other households coming out on the weekends by snow machine. Many family groups included young grandchildren. Goose hunting locations were scattered throughout Barrow's hunting range, with the heaviest concentrations along the Meade and Inaru rivers.

Incidental harvest of ptarmigan, eider and caribou were also recorded during June.

Barrow's fifth and final spring whale harvest of the year occurred much later than usual. On the evening of June 14, a 51 foot whale was struck and captured in an hour and 55 minutes. Four camps were still on the ice at the time of the harvest and seven boats participated in towing in the whale to shore. Many captains sent crew members onto the ice to assist in the butchering and crewshares were distributed to a total of 32 crews.

Travel to the whale harvest site by snowmachine was made difficult by the large, deep pools of water that had developed on the shorefast ice. Travel on the ice was suspended shortly after the last harvest.

Whale meat and maktak (whale skin with a thin layer of the attached blubber) were served at a number of different occasions during May and June. After a crew successfully harvested a whale, everyone was welcome at the successful captain's house for a meal of whale. When a successful crew brought its boat up off the ice, signifying the end of that crew's whaling season, the captain's and crew member's families served fermented whale meat (mikigaq), soup, cake, and tea to anyone who came down to the beach. A significant amount of whale was distributed at the Nalukataq, the whaling festivals. One was held in Browerville on Monday, June 29 and another in Barrow the following day.

The local rivers began breaking up in early June, effectively bringing most goose hunting trips to an end.

JULY

Two major shifts in harvest patterns occurred during July: families moved to camps inland and along the coast, and hunting by boat for marine mammals (other than bowheads) began. Subsistence activities at the Shooting Station or Pigniq also increased significantly during July to include eider hunting and fishing. Hunting for marine mammals by boat resulted in the occasional taking of caribou along the beach.

Field observations indicated that weather and ice conditions were major influences on the timing, intensity, and success of subsistence harvest activities in July, especially for marine mammal hunting. The grounded ice effectively prevented boat travel until July 5. During the next three days, the grounded ice floated out and summer boating began. July 9th through 12th was a very active hunting period. The weekend weather was sunny, winds were light, and the ice pack was within boating distance of Barrow (between seven and 20 miles out). Boat travel to camps at Peard Bay also began at this time. During the rest of the month, the ice pack moved in against shore on two occasions, remaining for three days and five days respectively.

Ringed seals, spotted seals, bearded seals, and walrus were harvested during July. Bearded seal was the preferred species and could be considered the target species during most boat hunting trips. An exception to this pattern occurred when the walrus were near shore in large numbers between July 9 and 13. The weather, wind, ice, and the timing (a weekend) all contributed to a successful harvest for many families.

July was not an active caribou harvesting period. The caribou were too lean this time of year to be sought in large numbers. According to one study participant, caribou harvests were limited to one or two, just to have some fresh meat.

During the last week of the month, boat travel began through Elson Lagoon to Admiralty Bay, providing boat access to camps in the Meade, Ikpikpuk, and Chipp river drainages.

AUGUST

Caribou, marine mammals, eiders, and fish were all harvested during the month of August. However, the weather during August was unusually poor for traveling and hunting. High winds often deterred boat travel and boat hunting. Traveling to camps by plane was often limited by low cloud cover and fog. Residents agreed that the weather was uncharacteristic for August and a common complaint was, "what happened to our summer this year?"

Bearded seal were harvested out in the drifting ice. Ringed seals were not actively pursued. As one participant stated, "we were out after oil," indicating the local preference for bearded seal oil. While the meat of ringed seal is highly desirable, the rendering of bearded seal blubber is much more common than rendering the blubber of ringed seal.

During the last week of August, the westerly winds moved the ice to within easy boating range of Barrow. The reported distance to the ice was a 20 minute boat ride, or approximately seven to eight miles from shore. While some hunters were deterred by the distance and the fog, at least 10 boats participated in a walrus hunt. Four walrus were harvested by one study household.

Unusually high water in the rivers during early August was reported to have a detrimental influence on fishing in Year One. One camp on the Chipp River was unable to catch as many fish as desired, reporting a good day's catch as four or five whitefish. Grayling harvests were reported in August, but again only a few fish a day. Net fishing for salmon took place on the inside of Point Barrow. Capelin were also harvested during the month in the shallows along the beach.

Moose hunting trips to the Colville River took place at the end of the month. Large herds of caribou were sighted north of the Meade River during the last week of August. Caribou were also harvested in the vicinity of inland camps, during boating trips in Admiralty Bay, and during inland hunting trips from coastal camps. While many caribou hunters reported harvesting only one or two caribou, some households reported bringing home as many as seven caribou from a hunting trip. Many hunters indicated that the emphasis on caribou hunting would be much higher in September when the animals would be fatter.

School began in late August. Adults employed by the schools and school-aged children moved from camp locations back to town.

SEPTEMBER

Major harvests for September included eider, caribou, and fish. Most caribou hunting and fishing occurred from inland camps. Field observations indicated that high winds blowing predominantly onshore made boat travel fairly uncommon during early September. The first snow fell on September 2. Barrow had occasional snow flurries until mid-month when a record 5.1 inches accumulated on September 14.

By the last week of September, the rivers were reportedly frozen well enough to cross, marking the beginning of easy and safe access by snowmachine to fish camps and caribou herds south of the Meade River. Fall fishing under the ice began near the end of the month and many study participants were preparing to spend time inland during October.

Bowhead whales began migrating south past Point Barrow during September.

OCTOBER

Travel by snowmachine to inland camps was a common activity throughout October. Cabins and tent sites are usually situated on a river near a traditional fishing area. Trips to other fishing sites and to hunt for caribou were usually day trips based out of those camps. Broad whitefish, humpback whitefish, and least cisco were the most common species caught in nets set in rivers under the ice. Broad whitefish and lake trout were harvested from lakes. Jigging for grayling and burbot were both common activities.

Most caribou hunting occurred on camping trips that varied in length from a few days to two or three weeks. Families would travel inland to their cabins and camp sites where they would set their nets and then travel out from camp in search of caribou. The rutting season for bull caribou began the second week of October, resulting in hunters targeting young bucks.

Snow cover was light south of the Meade River during October, which reportedly delayed hunters and caused problems with sleds traveling on rough, frozen tundra. Inland weather conditions were favorable to hunting and fishing: clear and cool with usually moderate winds.

At the start of the fall bowhead whale migration, Barrow whalers had no strikes or transfers remaining in their quota. On October 5, Nuiqsut whalers harvested a bowhead. On the 12th, Nuiqsut transferred their remaining strike to Barrow. On the afternoon of the 21st, Barrow harvested its sixth whale for the year, a 51 foot whale that was landed on shore with great difficulty the next afternoon.

On October 26, Kaktovik transferred their two strikes to Barrow and three days later a 28 foot whale was harvested by Barrow whalers. Calm conditions and the smaller size of the whale led to a relatively quick tow to shore by six boats. The whale was entirely butchered by 7:30 that evening. Both whales were harvested on the Beaufort Sea side of the point, north of the barrier islands. Barrow had one strike remaining at the end of the month.

NOVEMBER

Barrow whaling crews continued hunting through the first week of November. On November 6, the wind increased to 30 mph and the high winds continued until the 13th. Fall whaling was officially halted by Barrow whaling captains on November 14.

Seals were taken north of Barrow. Large ice pans were present near Point Barrow and the hunting technique included the use of small single-person boats. The ocean in front of Barrow remained slushy until late in the month. Ice firm enough for walking began to form around Thanksgiving.

Inland activities included fishing and caribou hunting, although these activities were not as intensively pursued as in October. The weather remained cool (-10° to -20° F) but calm during the last 10 days of the month. Some hunters endeavored to "get something fresh for Thanksgiving."

DECEMBER

Seal hunting was the major subsistence activity in December. One participant reported having requests from many elders for fresh seal. He had harvested seven ringed seals and stated that he had yet to finish supplying his extended family with the seals they desired.

Temperatures plummeted at month's end, with a daily average of -20° F., and wind speeds averaging 17 to 21 miles per hour during the period between the 26th and the 28th.

JANUARY

Hunters were targeting the larger ringed seals in January. According to one hunter, the focus on large seals at this time is due in part to the fact that the seals go into rut around late January, tainting the meat. Thus, to obtain the large skin and still be able to use the meat, the big seals are hunted at this time.

The coldest temperature of Year One was recorded on January 26: -43° F. on a relatively calm day. Another extreme was reached on January 1, when the wind gusts peaked at 58 mph while temperatures were averaging 1° F.

FEBRUARY

Seal hunting, polar bear hunting, trapping, and furbearer hunting were the primary harvest activities during February.

The average monthly temperature was lowest for Year One during February at -23° F. A relatively calm period occurred between the 8th and the 22nd, providing reportedly favorable traveling and hunting conditions.

MARCH

Ringed seal hunting continued to be a primary subsistence activity in March. One of the more active seal hunters observed fewer seals this year. Hunters indicated that sealing was made more difficult much of the time due to a frequent lack of open water.

Wolverine, fox, and caribou hunting also occurred during March. Caribou hunting occurred throughout the month, usually as day-long or overnight hunting trips from town.

Barrow individuals fished for rainbow smelt while visiting Wainwright.

> Preparation for the whaling season became a common activity this month. In preparation for whaling and the goose hunting that occurs shortly after whaling, many families were transporting supplies such as fuel and building materials to cabins. This was the month of longer days, good snow cover, and a little extra time before the full-time effort of whaling began.

In summary, the following list highlights the key subsistence-related dates and events for Year One. Also listed are the many events and holidays that indirectly influence harvest patterns. With full-time employment a reality for many heads of households, subsistence activities were often coordinated to coincide with long weekends and national holidays. Other local celebrations, such as Nalukataq, also affected subsistence activities. Successful whaling crews were especially active after whaling, expending extra effort hunting eiders and geese to serve at the feast. However, by the week prior to Nalukataq the crews and their families were no longer hunting but were occupied preparing food and dividing the whale for distribution at the celebration. Meanwhile, other Barrow families adjusted their harvest patterns (e.g., return from their camps or delay their departure) so that they might participate in Nalukataq.

DATE	ACTIVITY OR EVENT
April 15, 1987	Whaling crews begin to establish camps on the ice.
April 17-19	Spring carnival weekend.
April 19	Easter Sunday.
May 1	Whale harvest, Barrow's 1st whale.
May 2	Whale harvest, Barrow's 2nd whale.
May 4	Whale harvest, Barrow's 3rd whale.
May 17	Whale harvest, Barrow's 4th whale.
May 25	Memorial Day.
June 1	Rivers beginning to break up.
June 14	Whale harvest, Barrow's 5th whale.
June 19	Wainwright Nalukataq.
June 29-30	Barrow Nalukataq.
July 3-5	Fourth of July games.
July 8	Boat travel begins through passages in the grounded ice south of town.
July 11-13	Ice floes in front of town, good walrus & ugruk hunting.

DATE	ACTIVITY OR EVENT
July 17	Open ocean in front, ice north of town.
July 21-26	Eskimo Olympics in Fairbanks.
July 23	Passage to ocean blocked in front, open to the Point.
July 24	Boating to inland camps begins about this time.
August 27	First day of school.
August 31	Ice floes in front of Barrow, good walrus hunting.
September 1	First light snow in town.
September 7	Labor Day.
September 14	Record snow fall in 24 hours: 5.1 inches.
September 24	Wainwright school fire.
September 26	Rivers begin to freeze up.
October 6	Election day, local elections.
October 11	Caribou bulls are rutting.
October 12	Columbus day.
October 17-25	Alaska Federation of Natives convention in Anchorage.
October 19	Alaska day.
October 22	Whale harvest, Barrow's 6th whale.
October 29	Whale harvest, Barrow's 7th whale.
October 31	Halloween.
November 2	City and Borough run-off elections.
November 4	One of the last calm days for boat travel.
November 6-7	Siberian medical team in Barrow.
November 11	Veterans Day.
November 14	Whaling officially ends for the year.
November 18	Sun sets in Barrow for 65 days.
November 23	Ice firming up in front of town.
November 26	Thanksgiving Day.
December 25	Christmas.
January 7-10, 1988	Messenger Feast or Kivgiq held in Barrow.
January 23	First sunrise of the year.
February 17-19	Alaska Eskimo Whaling Convention held in Barrow.
March 14	Native Village of Barrow meeting, agenda includes discussion of U.S. Fish & Wildlife Service prohibitions on spring waterfowl hunting.

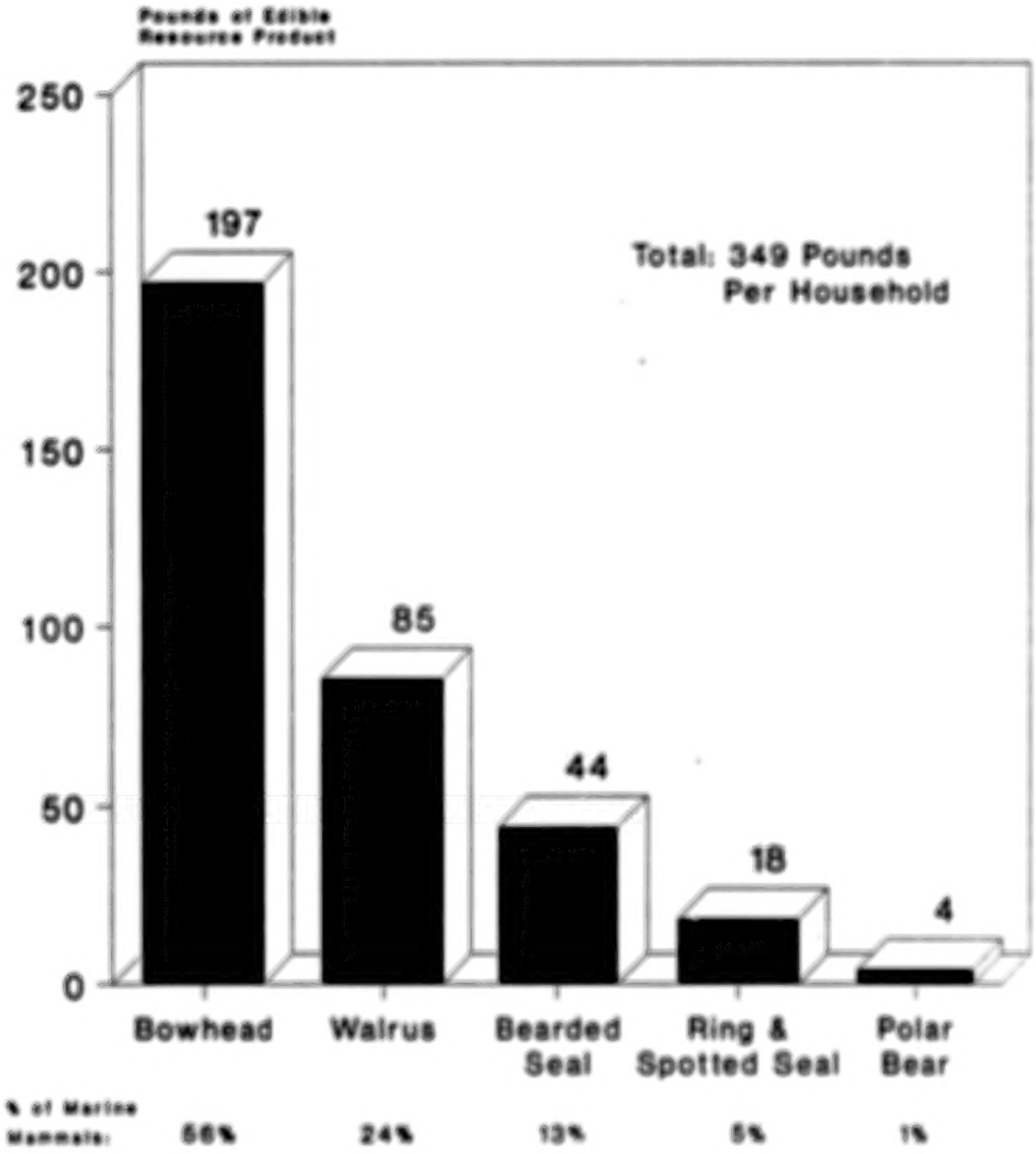
MARINE MAMMALS

As noted previously, the total pounds of marine mammals harvested was greater than for any other species category, accounting for 54 percent of the total edible pounds of all species harvested during Year One. Figure 3 graphically portrays how the average Year One household harvest of 349 pounds of marine mammals was distributed among the individual marine mammal species. Bowhead whale was the most important marine mammal resource. The harvest of seven bowhead whales in Year One accounted for half (56 percent) of the edible pounds of marine mammals harvested and 30 percent of the total community harvest for all species (Table 7). Next in importance were walrus, providing 24 percent of the marine mammal harvest, followed by bearded seal (13 percent), ringed and spotted seal (five percent), and polar bear (one percent). As stated previously, conspicuous in its absence was beluga whale. Barrow residents have harvested beluga in the past, although none were reported by the sample households during Year One. Study households did report receiving gifts of beluga from Point Lay and Wainwright.

Table 7 presents harvest estimates, sampling statistics and related information for the Year One Barrow marine mammal harvest. Column two provides the conversion factor for the edible weight of each species. The conversion factor is multiplied by the number of animals harvested by the entire community (column three) to determine the total pounds harvested for each species. All the marine mammal conversion weights except bowhead were derived from ADF&G (1987) data. The bowhead whale conversion weight represents the average edible weight of the seven whales harvested by Barrow whaling crews during Year One. While we are confident that these harvest data depict the relative importance of bowhead whale in the community of Barrow, estimating the total edible pounds of bowhead whale harvested was difficult. The study team weighed representative crewshares (i.e., the total amount of whale allocated to a crew at the butchering site) and crew member shares (i.e., an individual allocation of a crewshare) from each of the whales harvested and worked in cooperation with NSB Department of Wildlife Management researchers to weigh the entire edible portions of two bowhead whales. A description of the method used to determine edible weight of the individual whales is found in Conversions from Numbers to Pounds in the appendix.

Figure 3: Harvest of Marine Mammals All Barrow Households, Year One

(Mean Edible Pounds Per Household)



Source: Stephen R. Braund & Assoc., 1988

TABLE 7: HARVEST ESTIMATES FOR MARINE MAMMALS - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

RESOURCE	CONVERSION FACTOR (2) (Edible Weight Per Resource in lbs)	COMMUNITY TOTALS NUMBER HARVESTED	COMMUNITY TOTALS EDIBLE POUNDS HARVESTED	AVERAGE POUNDS HARVESTED PER HOUSEHOLD	AVERAGE POUNDS HARVESTED PER CAPITA	PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	PERCENT OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	SAMPLING STATISTICS STANDARD DEVIATION (lbs)	SAMPLING STATISTICS SAMPLING ERROR AT 95% (lbs)	SAMPLING STATISTICS LOW ESTIMATE (Mean lbs/ Household)	SAMPLING STATISTICS HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING STATISTICS SAMPLING ERROR AS % OF MEAN
Total Marine Mammals	n/a	n/a	327,182	349.2	108.5	53.8%	35.1%	27	53	295.8	402.5	15%
Bowhead (3,4)	26,375.4	7	184,628	197.0	61.2	30.3%	25.3%	0	0	197.0	197.0	0%
Walrus	772.0	104	79,996	85.4	26.5	13.1%	10.4%	20	40	45.8	125.0	46%
Bearded Seal	176.0	235	41,416	44.2	13.7	6.8%	21.4%	8	16	28.0	60.4	37%
Total Ring. & Spot. Seal	42.0	411	17,247	18.4	5.7	2.8%	12.8%	4	8	10.4	26.4	43%
Ringed Seal	42.0	408	17,153	18.3	5.7	2.8%	12.8%	4	8	10.3	26.3	44%
Spotted Seal	42.0	2	94	0.1	*	**	0.2%	0	0	0.1	0.1	44%
Polar Bear	696.0	6	3,898	4.2	1.3	0.6%	0.5%	2	5	0.0	8.9	113%

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(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

(3) Bowhead harvest does not contribute to the sampling error for marine mammals since the bowhead harvest is based on a complete count.

(4) The percent of Barrow households harvesting bowhead represents the percent of Barrow households receiving crew member shares at the whale harvest site, as extrapolated from the sample households.

* represents less than .1 pound

** represents less than .1 percent

n/a means not applicable

Source: Stephen R. Braund & Associates, 1988

The average edible weight for a bowhead of 26,376 pounds is the average edible weight of the seven whales harvested during Year One. The edible portion per whale ranged from 13,750 to 64,213 pounds. The per household harvest for all Barrow households was 197 pounds and the per capita harvest was 61 pounds. The estimated edible portion of each of these seven whales included the muscle or meat, the maktak, the tongue, and in most cases all of the whale blubber.

Walrus was the next most important marine mammal resource in terms of total edible pounds harvested (13 percent) followed by bearded seal (seven percent). The estimated harvest was 104 walrus, less than half the harvest of bearded seal. However, the estimated edible weight of walrus was almost twice that of bearded seal.

The importance of the bearded seal harvest, estimated at 235 animals, is not adequately measured in terms of edible pounds because their skins play an important role in the bearded seal harvest patterns of Barrow residents. Bearded seal skins are used to cover the whaling boats (umiat) and must be replaced every two to three years. Field observations determined that about one-third of the 46 Barrow whaling crews re-covered their boats in Year One. With an average of five skins per boat, over 70 skins were needed. Twenty-one percent of all Barrow households harvested bearded seals, similar to bowhead whale and nearly twice as many as harvested ringed seal or walrus.

The ringed and spotted seal harvest provided five percent of the marine mammal harvest and almost three percent of the total community harvest by weight. No ribbon seals were harvested by members of the sample households during the first year of the study. Though the harvest of 411 ringed and spotted seals was almost twice the number of bearded seals, the edible weight of these species (17,247 pounds) was less than one-half (42 percent) that of bearded seals (41,416 pounds). Thirteen percent of Barrow households (122 households) harvested ringed seals.

An estimated eight polar bears contributed 3,898 pounds to the community harvest, less than one percent of the total harvest. Less than one percent of all Barrow households harvested polar bears during the year. The sampling statistics in Table 7 indicate that the reliability of mean harvest estimates for each marine species except bowhead and polar bear are within the range of

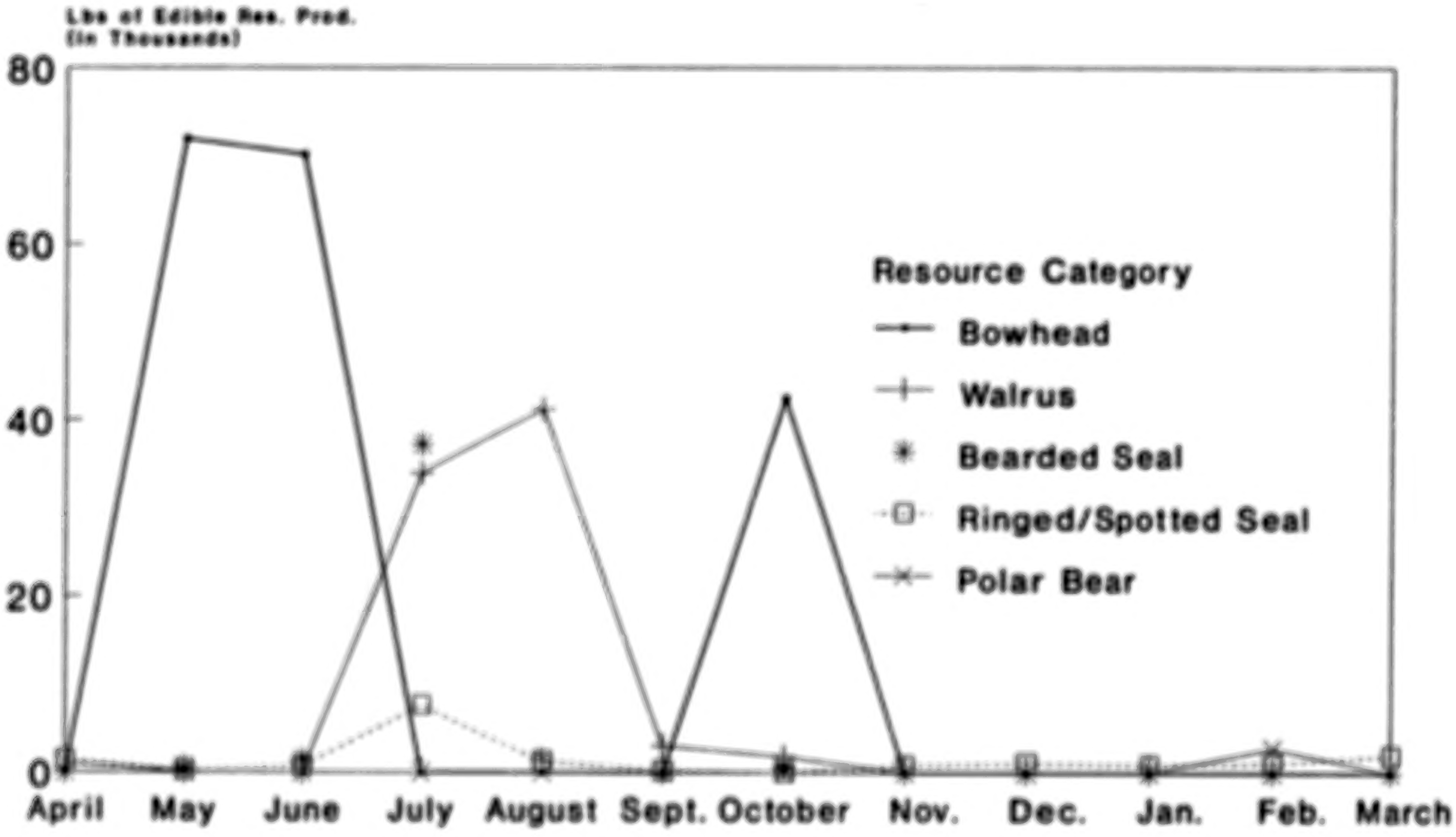
37 to 46 percent of the respective mean. Although the sampling error for polar bear indicates the harvest could be plus or minus 113 percent of the estimated mean harvest by weight, the harvest estimate of eight bears is considered by NSB Wildlife Management Department personnel to be very close to the actual number harvested during Year One (personal communication with department staff, 10/3/88).

During Year One, the vast majority of marine mammal harvests occurred from the beginning of spring whaling in mid-April to the end of fall whaling in early November (Figure 4, Tables 8 and 9). Spring bowhead whale harvests occurred in both May and June. July and August were the peak harvest months for seals and walrus: 51 percent of the ringed seal, 94 percent of the bearded seal, and 94 percent of the walrus harvests occurred in those months. Hunters focused first on ringed seals until the bearded seals arrived in large numbers, then targeted mainly bearded seals to obtain necessary supplies of skins and oil. Walrus were harvested periodically throughout the summer when they floated with the ice pack to within range of Barrow hunters (i.e., within about 30 miles of the coast).

September was a relatively inactive marine mammal harvest month. The majority of the harvest was walrus, although the month accounted for only three percent of the year's walrus harvest. Two whales were harvested in October, contributing almost one quarter (23 percent) of the year's whale harvest. After fall whaling, the ice formed along shore in early November and ringed seals were the majority of the harvest through the remainder of the study year. February was an exception when 72 percent of the polar bear harvest took place. Ringed seal harvests doubled in March compared to the previous four months.

A comparison of the current marine mammal harvest area to the lifetime community harvest area documented by Pedersen (1979) in Map 4 implies that hunters now travel farther offshore for marine mammals than they did prior to 1978. The advent in the past several years of larger aluminum and fiberglass boats and more powerful outboard motors in Barrow may have extended the distance that the marine mammal hunters can safely travel offshore since harvest range data were collected by Pedersen (Braund and Burnham 1984; Alaska Consultants, Inc. et al. 1984). The majority of Year One harvests recorded for

Figure 4: Monthly Harvest of Marine Mammals All Barrow Households, Year One



Source: Stephen R. Braund & Assoc., 1988

TABLE 8: MARINE MAMMAL HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Pounds of Edible Resource Product)

TOTALS

	1987									1988		
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
Bowhead Whale	0	72,004	70,158	0	0	0	42,464	0	0	0	0	0
Walrus	0	0	0	33,945	41,241	3,015	1,790	0	0	0	0	0
Bearded Seal	0	589	1,414	37,240	1,451	0	680	39	0	0	0	0
Total Ring. & Spot. Seal	1,418	234	732	7,626	1,210	216	0	803	1,110	854	1,086	1,956
Ringed Seal	1,418	234	732	7,626	1,116	216	0	803	1,110	854	1,086	1,956
Spotted Seal	0	0	0	0	94	0	0	0	0	0	0	0
Polar Bear	1,107	0	0	0	0	0	0	0	0	0	2,790	0
All Marine Mammals	2,526	72,828	72,304	78,811	43,901	3,232	44,934	842	1,110	854	3,877	1,956

PERCENTS

	1987									1988			
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	
Bowhead Whale	0%	39%	38%	0%	0%	0%	23%	0%	0%	0%	0%	0%	= 100%
Walrus	0%	0%	0%	42%	52%	4%	2%	0%	0%	0%	0%	0%	= 100%
Bearded Seal	0%	1%	3%	90%	4%	0%	2%	0%	0%	0%	0%	0%	= 100%
Total Ring. & Spot. Seal	8%	1%	4%	44%	7%	1%	0%	5%	6%	5%	6%	11%	= 100%
Ringed Seal	8%	1%	4%	44%	7%	1%	0%	5%	6%	5%	6%	11%	= 100%
Spotted Seal	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Polar Bear	28%	0%	0%	0%	0%	0%	0%	0%	0%	0%	72%	0%	= 100%
All Marine Mammals	1%	22%	22%	24%	13%	1%	14%	0%	0%	0%	1%	1%	= 100%

Source: Stephen R. Braund & Associates, 1988

TABLE 9: MARINE MAMMAL HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Number Harvested)

	1987									1988		
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
Bowhead Whale	0	4	1	0	0	0	2	0	0	0	0	0
Walrus	0	0	0	44	53	4	2	0	0	0	0	0
Bearded Seal	0	3	8	212	8	0	4	0	0	0	0	0
Total Ring. & Spot. Seal	34	6	17	182	29	5	0	19	26	20	26	47
Ringed Seal	34	6	17	182	27	5	0	19	26	20	26	47
Spotted Seal	0	0	0	0	2	0	0	0	0	0	0	0
Polar Bear	2	0	0	0	0	0	0	0	0	0	6	0

Source: Stephen R. Braund & Associates, 1988

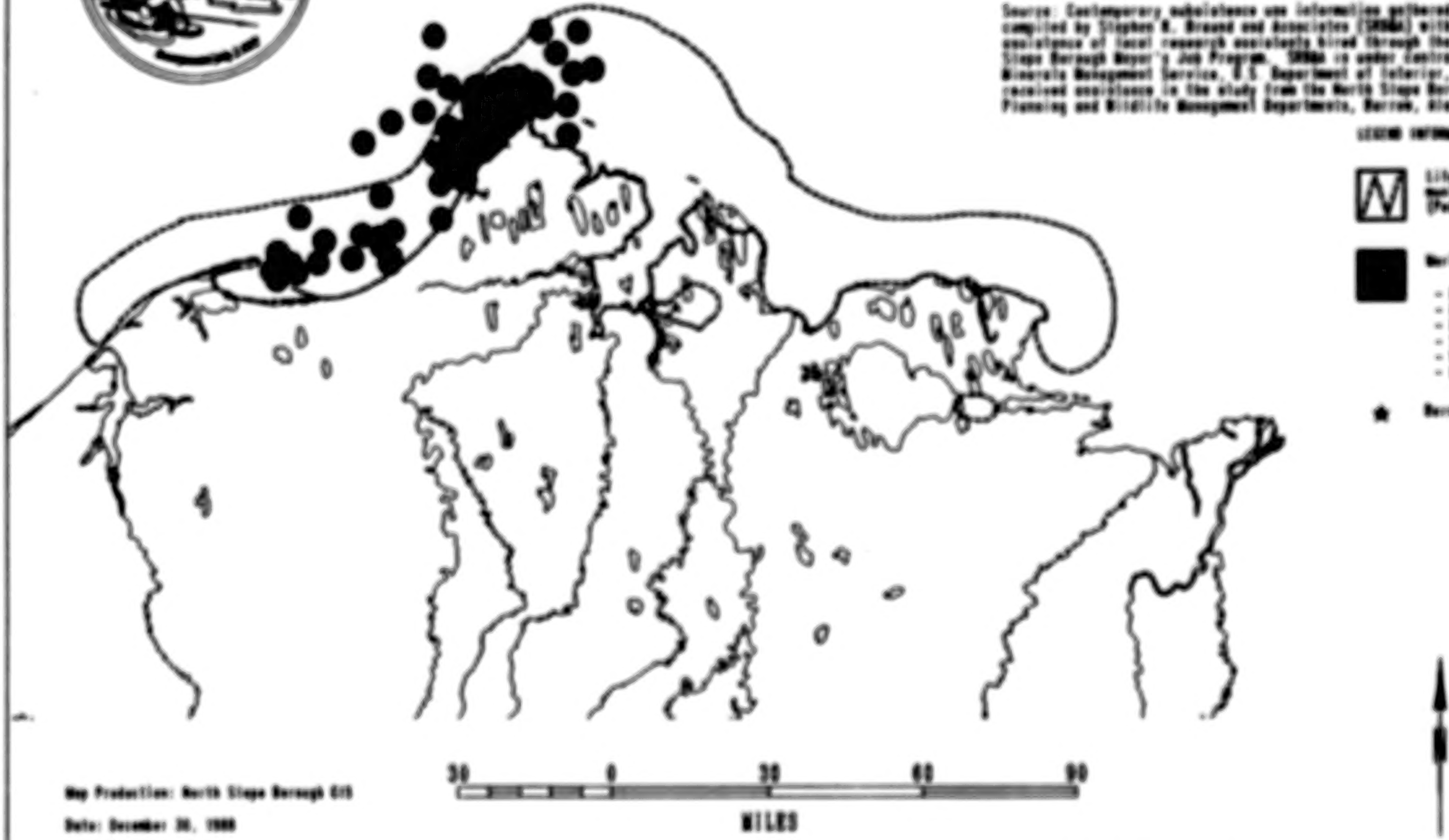
MAP 4

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

MARINE MAMMAL HARVEST SITES -- ALL SPECIES

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in this study. Lifetime-community harvest areas, collected in the form of map biographies from 28 Barrow households (Pedersen 1979), are also illustrated.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



LEGEND INFORMATION

Lifetime community land use (Pedersen 1979).

Marine Mammals

- Bowhead whale
- Bearded seal
- Ringed seal
- Spotted seal
- Walrus
- Polar bear

Barrow

Map Production: North Slope Borough GIS

Date: December 30, 1988

the study households were located on the Chukchi side of Point Barrow, primarily between Point Franklin and Point Barrow and extending offshore approximately 25 miles. A more intensive use area is within a radius of 15 miles from the village.

In Year One, no marine mammal harvest locations were recorded in the eastern half of the Barrow harvest use area. Admiralty Bay and Smith Bay are used extensively for marine travel, providing boat access to cabins, fish sites and hunting areas on the Meade, Usuktuk, Topagoruk, Chipp, and Ikpikpuk rivers and on Teshekpuk Lake. According to study households and the lifetime community use boundary on Map 4, harvests have occurred in those bays in the past (e.g., polar bear, bearded seal, and especially spotted seal), as well as in the Cape Halkett area. However, no marine mammal harvests were recorded there during Year One.

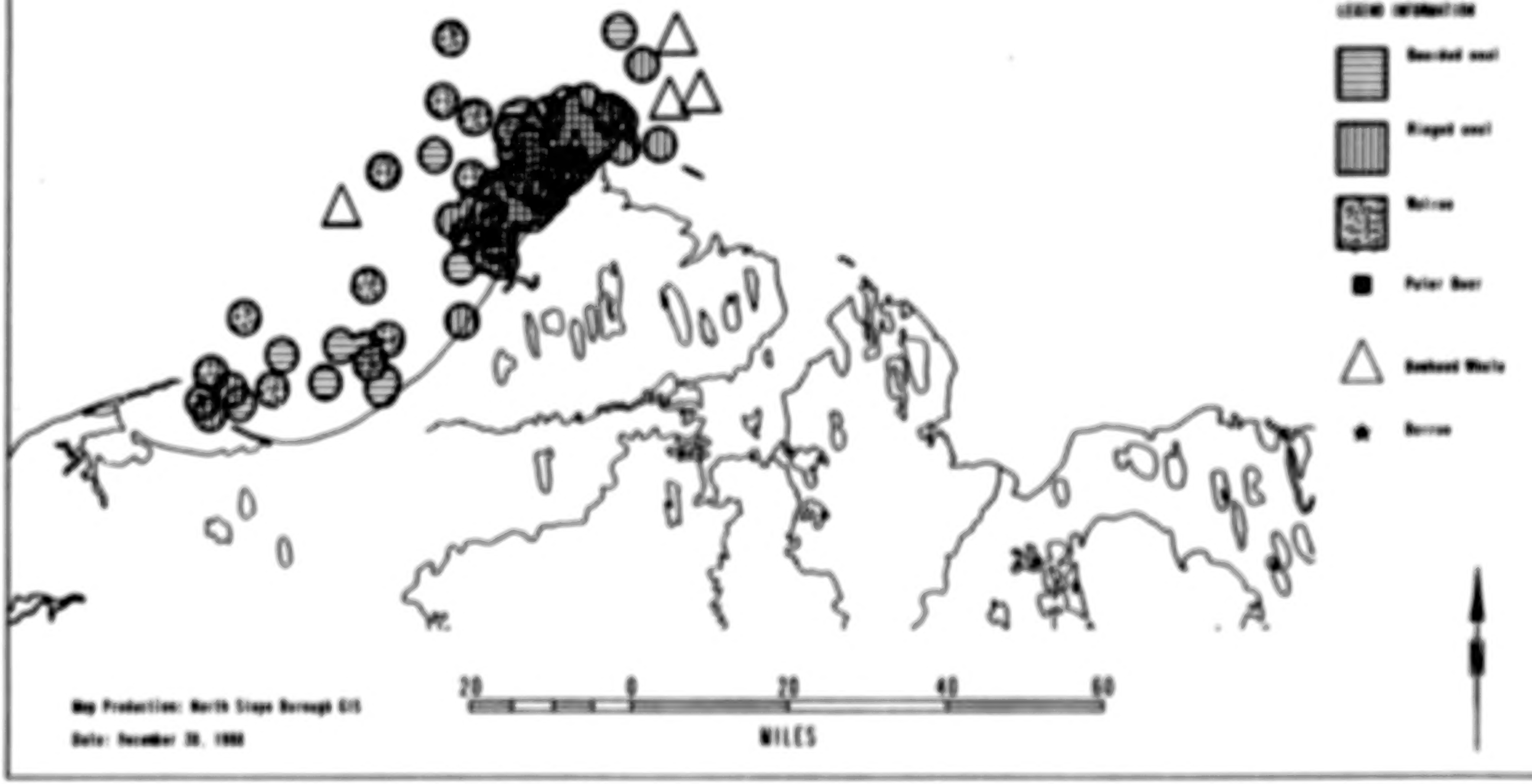
Map 5 illustrates marine mammal harvest locations by species and reveals that hunters ranged farthest offshore in pursuit of walrus, approximately 25 miles. Two of the bowhead whale harvests (one in the spring and one in the fall) and a bearded seal harvest also occurred a similar distance from shore. Three of the whale harvests took place next to the edge of the open lead, approximately four miles out from Barrow. Hunters harvested seals and walrus along the entire length of coast between Barrow and Peard Bay. As hunting pressure increased during the summer, hunters were more successful when ranging farther from Barrow, especially when in pursuit of the bearded seal. There is, however, a significant overlap between species. While hunters may have been looking for a particular species, harvests of bearded seal, walrus, and ringed seal were possible at any location during the open water season.

Marine mammal harvest locations are displayed by season in Map 6. The two seasons (June to October and November to May) correspond respectively with the two primary travel modes used in marine mammal hunting: hunting from boats in open water and hunting from the ice, either based at whaling camps or while traveling over the ice by foot or snowmachine. Map 6 clearly illustrates that ice-based hunting occurred primarily within the vicinity of Barrow, with hunters ranging out over the ice to a distance of about 12 miles. The month of May was a transitional time in terms of marine travel and the marine mammal harvests located 15 miles off Point Barrow took place from boats during mid- to

MAP 5
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
MARINE MAMMAL HARVEST SITES BY SPECIES

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two-mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



Map Production: North Slope Borough GIS

Date: December 30, 1988

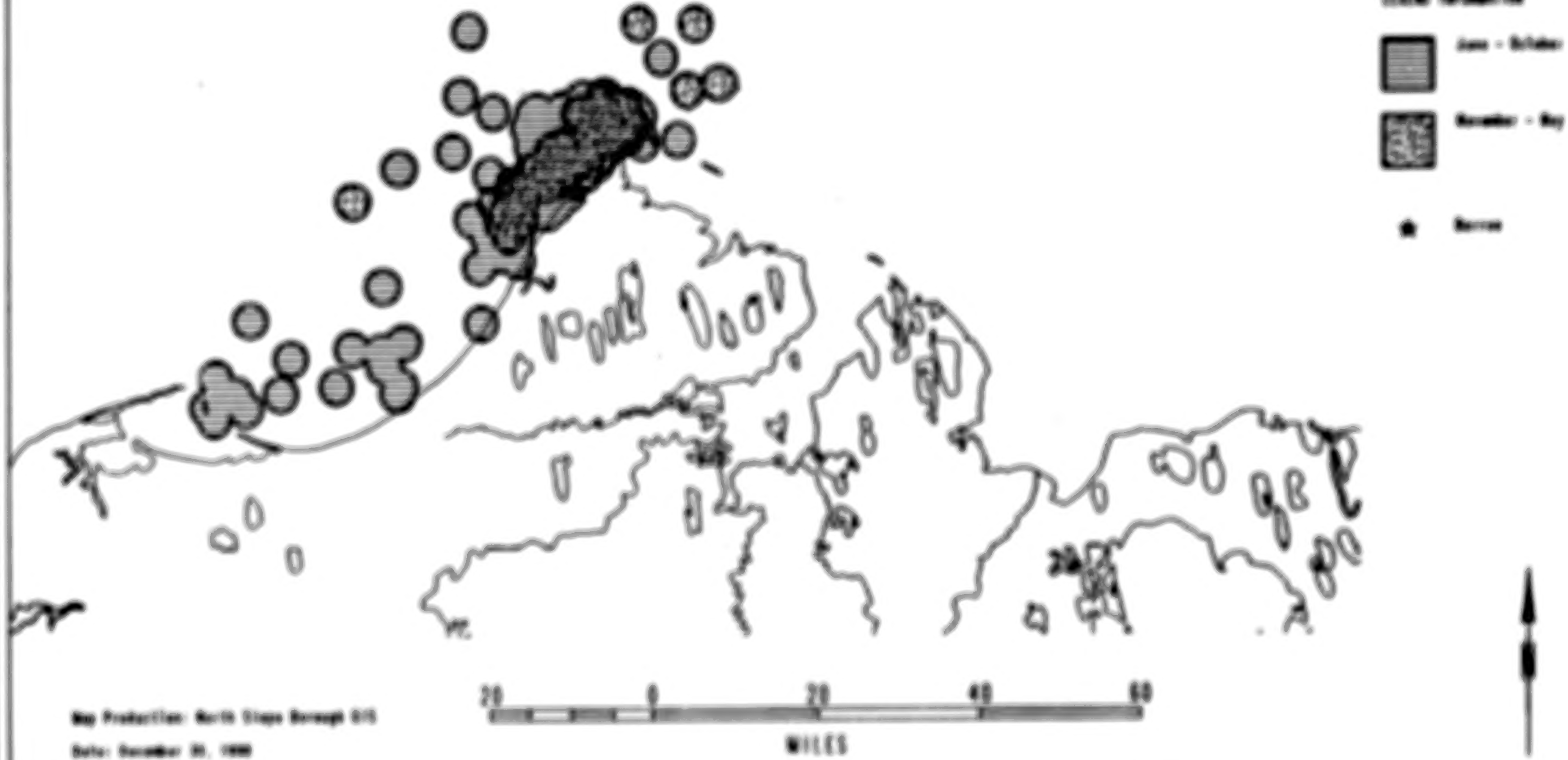
MAP 6

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

MARINE MAMMAL HARVEST SITES BY SEASON

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



Map Production: North Slope Borough GIS

Date: December [illegible], 1988

48

late May. The summer season allowed hunters to travel much greater distances, both from town and while based at hunting camps along the coast.

TERRESTRIAL MAMMALS

Terrestrial mammals contributed one-third (199,058 pounds) of the total edible pounds harvested by Barrow residents in Year One (Table 10). The harvest of terrestrial mammals provided an average of 212 pounds per Barrow household, with over 99 percent of the harvest consisting of caribou and moose.

The considerable contribution of caribou to the total harvest is evident in Figure 5 and Table 10. Caribou is the most important terrestrial mammal harvested by Barrow residents and is in fact the only terrestrial mammal harvested by many families. Eighty-eight percent of the edible pounds of terrestrial mammal harvest was caribou, totaling over 170,000 pounds in Year One. Averaged over the entire community, 186 pounds of caribou were harvested per household in Year One. Twenty-three percent of all Barrow households participated in harvesting 1,492 animals, an average of nearly seven caribou for each of the 215 participating households. On a community-wide level, the total harvest equals approximately 1.6 caribou per Barrow household.

Moose was the next most important terrestrial resource harvested, providing approximately 12 percent of the total harvest of terrestrial mammals. The average moose harvest was approximately 25 pounds per household. Brown bear, Dall sheep, porcupine and ground squirrel comprised the remainder of the terrestrial mammal harvests. The contribution of these species together was less than one percent of the harvest of terrestrial mammals during Year One. With the exception of caribou, the other terrestrial mammal species are harvested in such low numbers and by so few households that the estimate of the total amount harvested is statistically less reliable (evident in the increased sampling error as a percentage of the mean in Table 10). The data in this section do not include the harvest of wolf, fox and wolverine since these species are used only for their furs.

Presented in Figure 6 and Tables 11 and 12 are the monthly harvests of terrestrial mammals. As can be seen in Figure 6, caribou are harvested

TABLE 10: HARVEST ESTIMATES FOR TERRESTRIAL MAMMALS - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

	CONVERSION FACTOR (2)	COMMUNITY TOTALS		AVERAGE POUNDS HARVESTED			PERCENT		SAMPLING STATISTICS			
RESOURCE	(Edible Weight Per Resource in lbs)	NUMBER HARVESTED	EDIBLE POUNDS HARVESTED	PER HOUSEHOLD	PER CAPITA	PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	STANDARD DEVIATION (lbs)	SAMPLING ERROR AT 95% (lbs)	LOW ESTIMATE (Mean lbs/ Household)	HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING ERROR AS % OF MEAN
Total Terrestrial Mammals	n/a	n/a	199,058	212.4	66.0	32.7%	26.4%	27	54	158.61	266.27	25%
Caribou	117.0	1,492	174,542	186.3	57.9	28.7%	22.9%	26	51	135.27	237.29	27%
Moose	500.0	47	23,579	25.2	7.8	3.9%	5.1%	12	23	2.37	47.96	91%
Dall Sheep	99.0	8	765	0.8	0.3	0.1%	0.8%	1	1	0.00	2.31	183%
Brown Bear	100.0	1	112	0.1	*	**	0.1%	0	0	0.04	0.19	63%
Other Terrestrial Mammals		27	61	0.1	*	**	0.7%	0	0	0.00	0.16	153%
Porcupine	10.0	5	52	0.1	*	**	0.6%	0	0	0.00	0.15	179%
Ground Squirrel	0.4	22	9	0.01	*	**	0.1%	0	0	0.00	0.02	71%
Wolverine	n/a	3	n/a	n/a	n/a	n/a	0.4%	n/a	n/a	n/a	n/a	n/a
Arctic Fox (Blue)	n/a	165	n/a	n/a	n/a	n/a	2.2%	n/a	n/a	n/a	n/a	n/a
Red Fox (Cross, Silver)	n/a	8	n/a	n/a	n/a	n/a	0.1%	n/a	n/a	n/a	n/a	n/a

---

(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

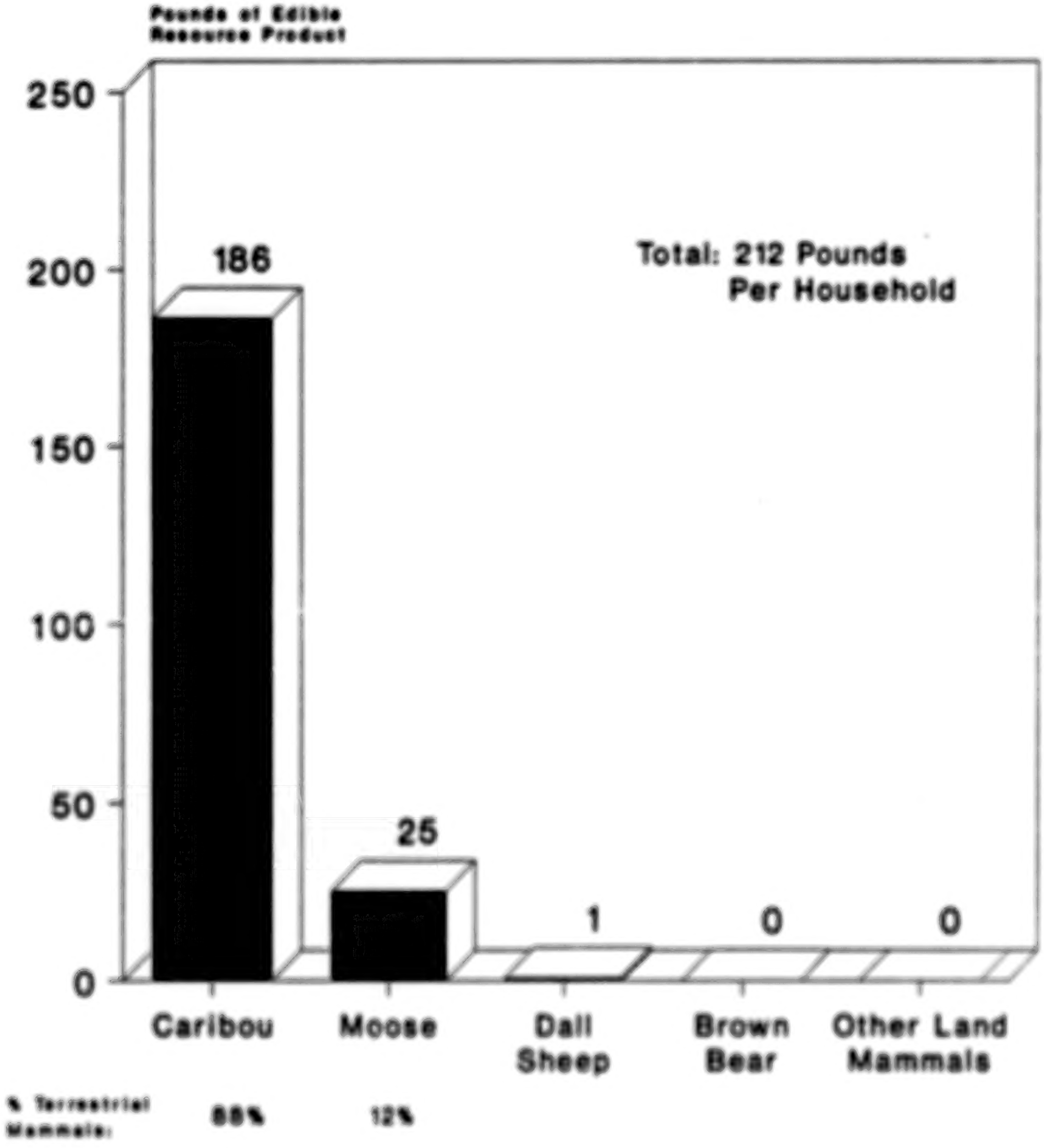
* represents less than .1 pound

** represents less than .1 percent

n/a means not applicable

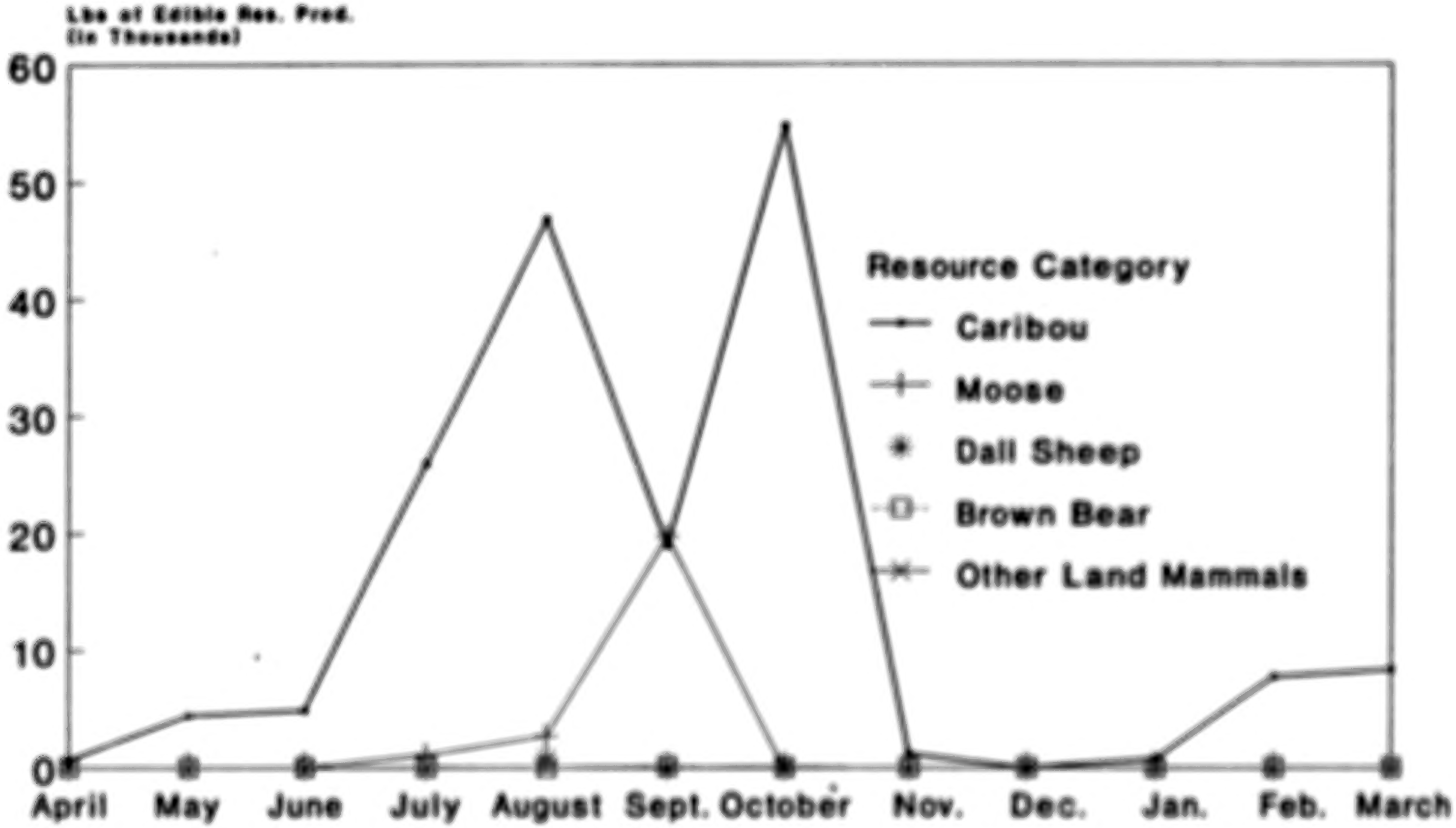
Source: Stephen R. Braund & Associates, 1988

Figure 5: Harvest of Terrestrial Mammals
All Barrow Households, Year One
(Mean Edible Pounds Per Household)



Source: Stephen R. Braund & Assoc., 1988

Figure 6: Monthly Harvest of Terrestrial Mammals All Barrow Households, Year One



Source: Stephen R. Braund & Assoc., 1988

TABLE 11: TERRESTRIAL MAMMAL HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Pounds of Edible Resource Product)

TOTALS

SPECIES	1987 April	May	June	July	August	Sept.	October	Nov.	Dec.	1988 Jan.	Feb.	March
Caribou	653	4,460	4,910	25,879	46,782	18,948	54,781	1,181	0	783	7,782	8,372
Moose	0	0	0	1,116	2,744	19,717	0	0	0	0	0	0
Dall Sheep	0	0	0	0	765	0	0	0	0	0	0	0
Brown Bear	0	0	0	0	0	112	0	0	0	0	0	0
Other Terrestrial Mammals	0	0	0	9	0	0	52	0	0	0	0	0
Porcupine	0	0	0	0	0	0	52	0	0	0	0	0
Ground Squirrel	0	0	0	9	0	0	0	0	0	0	0	0
All Terrestrial Mammals (excluding furbearers)	653	4,460	4,910	27,004	50,291	38,777	54,833	1,181	0	783	7,782	8,372

PERCENTS

SPECIES	1987 April	May	June	July	August	Sept.	October	Nov.	Dec.	1988 Jan.	Feb.	March	
Caribou	0%	3%	3%	15%	27%	11%	31%	1%	0%	0%	4%	5%	= 100%
Moose	0%	0%	0%	5%	12%	84%	0%	0%	0%	0%	0%	0%	= 100%
Dall Sheep	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Brown Bear	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	= 100%
Other Terrestrial Mammals	0%	0%	0%	15%	0%	0%	85%	0%	0%	0%	0%	0%	= 100%
Porcupine	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	= 100%
Ground Squirrel	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
All Terrestrial Mammals (excluding furbearers)	0%	2%	2%	14%	25%	19%	28%	1%	0%	0%	4%	4%	= 100%

Source: Stephen R. Braund & Associates, 1988

TABLE 12: TERRESTRIAL MAMMAL HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Number Harvested)

	1987					TOTALS				1988		
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
Caribou	6	38	42	221	400	162	468	10	0	7	67	72
Moose	0	0	0	2	5	39	0	0	0	0	0	0
Dall Sheep	0	0	0	0	8	0	0	0	0	0	0	0
Brown Bear	0	0	0	0	0	1	0	0	0	0	0	0
Other Terrestrial Mammals	0	0	0	22	0	0	5	0	0	0	0	0
Porcupine	0	0	0	0	0	0	5	0	0	0	0	0
Ground Squirrel	0	0	0	22	0	0	0	0	0	0	0	0
Wolverine	0	0	0	0	0	0	1	0	0	0	0	2
Arctic Fox (Blue)	0	0	0	0	0	0	1	0	79	35	32	18
Red Fox (Cross, Silver)	0	0	0	0	0	0	0	0	0	0	0	8

Source: Stephen R. Braund & Associates, 1988

throughout the year; the study households harvested caribou in every month except December. Most caribou harvests took place from July through October with two peak harvest months, August and October. Caribou harvests increased noticeably in February and March as compared with the three preceding winter months. February and March were the months to put fresh meat on the table, obtain caribou for consumption at whaling camp, and provide for families who had depleted their subsistence foods supply. As represented by the data, very little caribou hunting occurred in April.

September was the principal moose harvesting month when 84 percent of the harvest occurred. Moose that wandered near summer fish camps earlier in the season were sometimes harvested. Residents reported seeing moose closer to Barrow in recent years, though there were reports that such moose often appeared sickly. The brown bear harvest took place in September and the Dall sheep were harvested in August, 100 percent of those species being harvested in the respective months. Porcupine and ground squirrel harvests were recorded in October and July respectively.

Barrow hunters harvested terrestrial mammals throughout the central portion of the lifetime community land use area shown on Map 7. Map 8 illustrates that those harvests occurring farthest from Barrow were primarily moose hunted along the Colville River drainage. Of the furbearer harvests recorded in Year One, fox were taken primarily in the vicinity of Barrow, while wolverine were taken as far as 150 miles from Barrow in the upper reaches of the Ikpikpuk drainage. Discussions with other hunters indicated that fox harvests also occurred in that area. No wolf harvests were reported in Year One and hunters were surprised at their scarcity, with a paucity of tracks even in the more mountainous terrain near the Colville drainage.

Caribou harvests varied by location, not only according to the animal's presence or absence, but also in relation to what other harvest activities were taking place and the mode of transportation. Map 9 displays the caribou harvest locations by four seasons. (As explained in Subsistence Overview, enlargement of this map to show the main harvest areas more clearly resulted in the omission of two sites described below.) Fieldwork for this study found that because the spring season (April, May, and June) was characterized primarily by whaling activities, caribou hunting at this time was for fresh

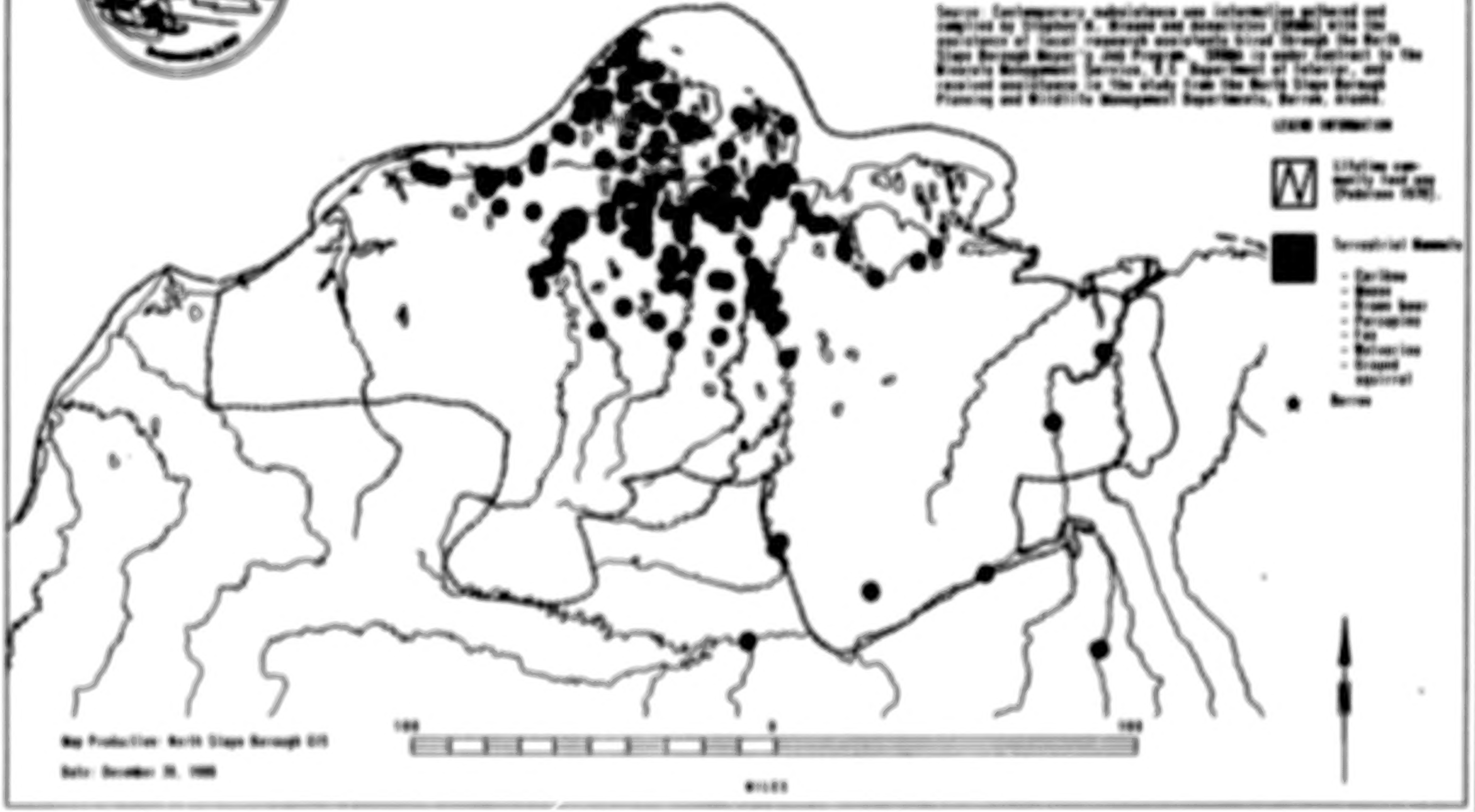
MAP 7

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

TERRESTRIAL MAMMAL HARVEST SITES -- ALL SPECIES

This draft map depicts approximate subsistence harvest sites used by 110 Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence uses for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in this study. Lifetime-community harvest areas, collected in the form of map biographies from [illegible] Barrow households (Pedersen 1979), are also illustrated.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of the Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



Map Production: North Slope Borough GIS

Date: December [illegible], 1988

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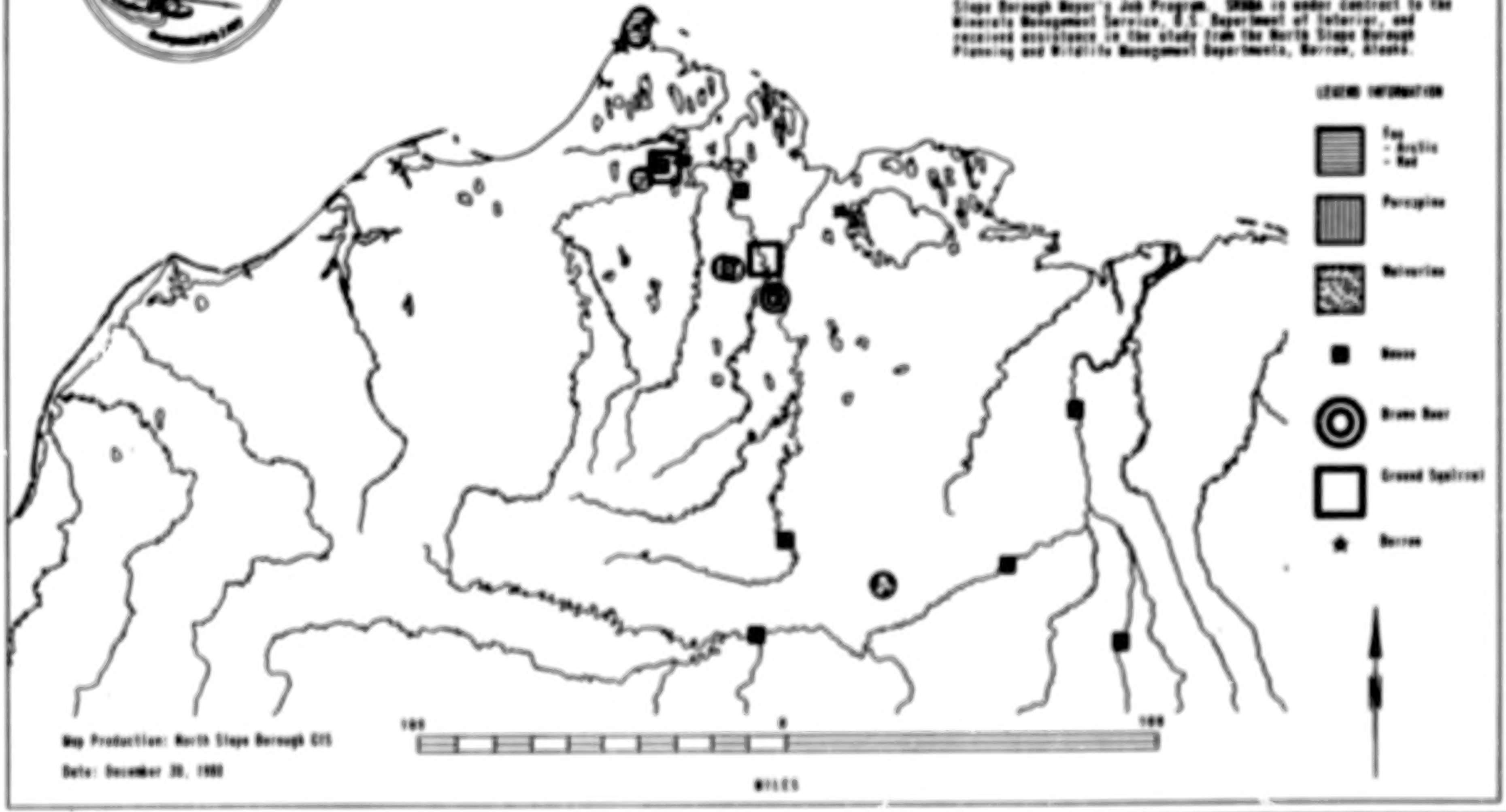
MAP 8
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
TERRESTRIAL MAMMAL HARVEST SITES BY SPECIES (EXCLUDING CARIBOU)

This draft map depicts approximate subsistence harvest sites used by 110 Barrow households (13 percent of the community households). All harvest sites are depicted with a two-mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRBA) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRBA is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



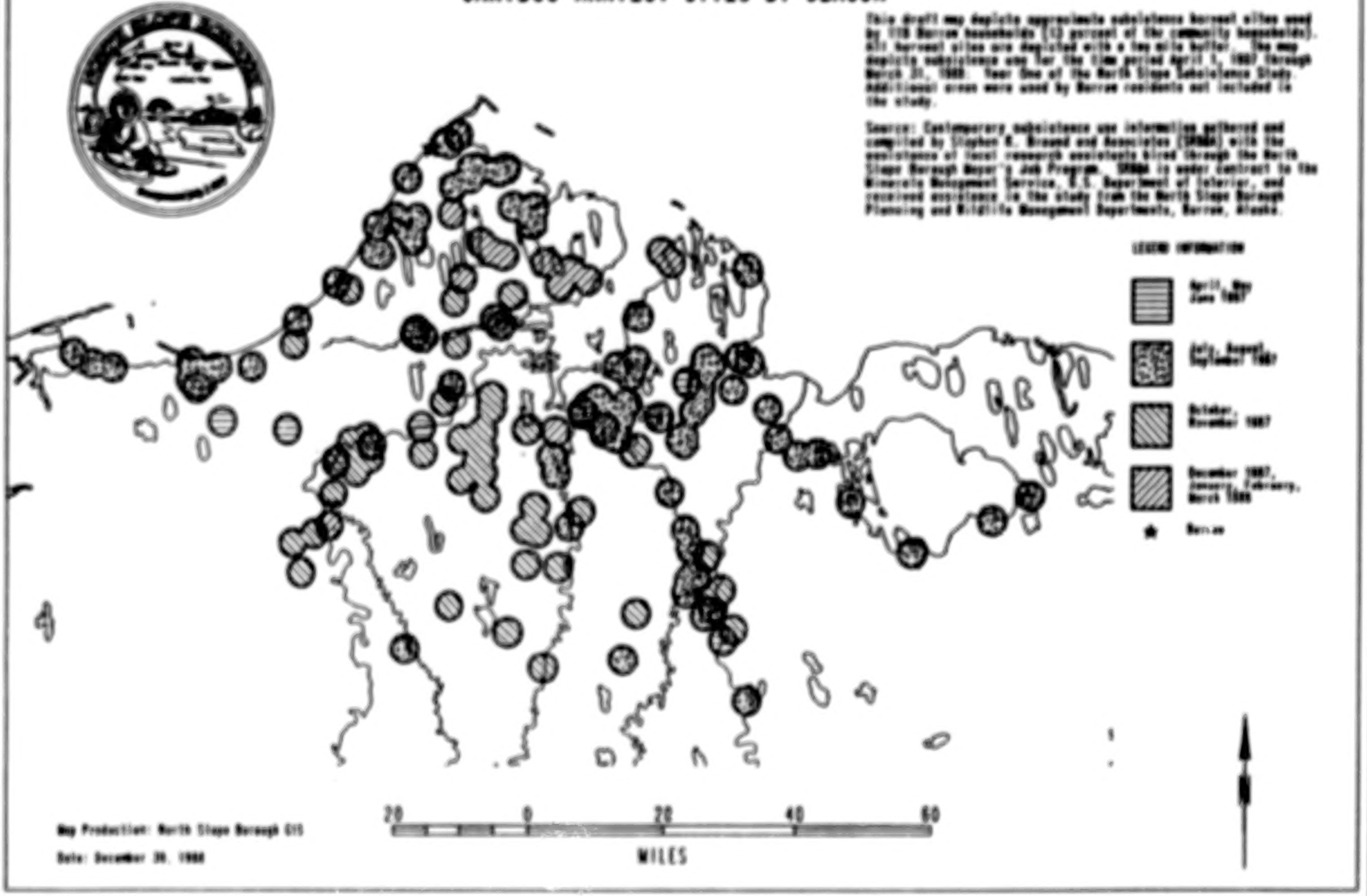
Map Production: North Slope Borough GIS

Date: December 20, 1988

MAP 9

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

CARIBOU HARVEST SITES BY SEASON



This draft map depicts approximate subsistence harvest sites used by 110 Barrow households (12 percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRBA) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRBA is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.

Map Production: North Slope Borough GIS

Date: December 30, 1988

food for whaling camps. Travel during this time was by snowmachine and harvests were sometimes incidental to the chore of hauling fuel, building materials, and other supplies to inland fish camps. The trips were usually of short duration as hunters were out to harvest fresh food for whaling camp and were anxious to get back to help with the whaling preparations.

During the summer months of July, August, and September, caribou were hunted mainly from boats. Map 9 reflects coastal harvest locations extending from Point Franklin to Cape Simpson. Boat-based caribou harvests are also evident around Admiralty Bay, Teshekpuk Lake, and at least 100 miles from Barrow along the Usuktuk and Ikpikpuk rivers. (A September harvest not shown on Map 9 occurred on the Ikpikpuk River south of the southernmost site on the map, which is also on the Ikpikpuk.) Additional summer caribou harvests took place in the vicinity of Barrow, where walking, three-wheelers, or trucks were the usual modes of travel.

October and November were fall fishing months and travel was primarily by snowmachine, although some boat travel did occur associated with fall whaling. Hunters ranged far inland during this period, and the fall caribou harvest area was approximately defined by an 80 mile arc to the south of Barrow. Additionally, one caribou harvest location was in the vicinity of Nuiqsut in November. This harvest is not shown on Map 9, but can be seen on Map 7.

Finally, from December through March caribou were harvested mainly in the vicinity of Barrow. Hunters traveling specifically to harvest caribou rarely ranged south of the Meade River. By March, greater numbers of people were traveling to their camps to deliver supplies for the summer or to retrieve fish stored in ice cellars. Occasionally caribou were harvested on those trips.

FISH

Fish rank third among the five major resource categories in terms of total edible pounds produced by Barrow households contributing 62,895 pounds or approximately 10 percent of the total Year One harvest of all species by weight (Table 13). Whitefish (mainly river-caught broad whitefish, non-specified whitefish, humpback whitefish and least cisco) provided eight percent of the

TABLE 15: HARVEST ESTIMATES FOR FISH - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

RESOURCE	CONVERSION FACTOR (2) (Edible Weight Per Resource in lbs)	COMMUNITY TOTALS: NUMBER HARVESTED	COMMUNITY TOTALS: EDIBLE POUNDS HARVESTED	AVERAGE POUNDS HARVESTED: PER HOUSEHOLD	AVERAGE POUNDS HARVESTED: PER CAPITA	PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	PERCENT OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	SAMPLING STATISTICS: STANDARD DEVIATION (lbs)	SAMPLING STATISTICS: SAMPLING ERROR AT 95% (lbs)	SAMPLING STATISTICS: LOW ESTIMATE (Mean lbs/ Household)	SAMPLING STATISTICS: HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING STATISTICS: SAMPLING ERROR AS % OF MEAN
Total Fish	n/a	n/a	62,895	67.12	20.9	10.3%	22.1%	8	16	51.40	82.85	23%
Total Whitefish		26,067	50,388	53.78	16.7	8.3%	16.5%	6	13	41.13	66.42	24%
Whitefish (non-specif.)	2.0	4,936	9,873	10.54	3.3	1.6%	3.6%	2	4	6.86	14.21	35%
Round Whitefish	1.0	1,903	1,903	2.03	0.6	0.3%	5.7%	0	1	1.11	2.95	45%
Broad Whitefish (River)	2.5	9,848	24,621	26.28	8.2	4.0%	8.2%	5	10	16.40	36.15	38%
Broad Whitefish (Lake)	3.4	915	3,112	3.32	1.0	0.5%	1.3%	1	2	1.17	5.48	65%
Humpback whitefish	2.5	1,609	4,023	4.29	1.3	0.7%	3.3%	2	4	0.00	8.69	102%
Least cisco	1.0	5,638	5,639	6.02	1.9	0.9%	2.3%	1	3	3.09	8.94	49%
Bering, Arctic cisco	1.0	1,218	1,218	1.30	0.4	0.2%	0.4%	0	1	0.72	1.88	45%
Total Other Frshwater Fish		10,378	11,459	12.23	3.8	1.9%	13.2%	3	5	6.82	17.64	44%
Arctic grayling	0.8	9,377	7,502	8.01	2.5	1.2%	10.9%	2	4	4.38	11.63	45%
Arctic char	2.8	35	98	0.10	*	**	2.6%	0	0	0.00	0.24	126%
Burbot (Ling cod)	'.0	866	3,465	3.70	1.1	0.6%	5.5%	1	2	1.49	5.91	60%
Northern pike	2.3	2	5	0.01	*	**	0.2%	0	0	0.01	0.01	0%
Lake trout	4.0	97	388	0.41	0.1	0.1%	0.6%	0	0	0.25	0.58	40%
Total Salmon		162	972	1.04	0.3	0.2%	2.1%	0	1	0.39	1.68	62%
Salmon (non-specified)	6.1	61	374	0.40	0.1	0.1%	0.2%	0	0	0.22	0.58	46%
Chum (Dog) salmon	6.1	5	31	0.03	*	**	0.6%	0	0	0.00	0.09	180%
Pink (Humpback) salmon	3.1	16	50	0.05	*	**	0.4%	0	0	0.03	0.08	52%
Silver (Coho) salmon	6.0	76	455	0.49	0.2	0.1%	1.0%	0	1	0.00	1.09	125%
King (Chinook) salmon	18.0	3	60	0.06	*	**	0.1%	0	0	0.02	0.11	63%
Total Other Coastal Fish		380	76	0.08	*	**	0.4%	0	0	0.05	0.12	42%
Capelin	0.2	335	67	0.07	*	**	0.2%	0	0	0.04	0.11	47%
Rainbow smelt	0.2	45	9	0.01	*	**	0.1%	0	0	0.00	0.02	72%

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(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

* represents less than .1 pound
** represents less than .1 percent
n/a means not applicable

Source: Stephen R. Braund & Associates, 1988

total community harvest by weight. The other freshwater fish, primarily grayling and burbot, provided two percent of the total community harvest. Salmon and other coastal fish provided less than one percent of the total community harvest.

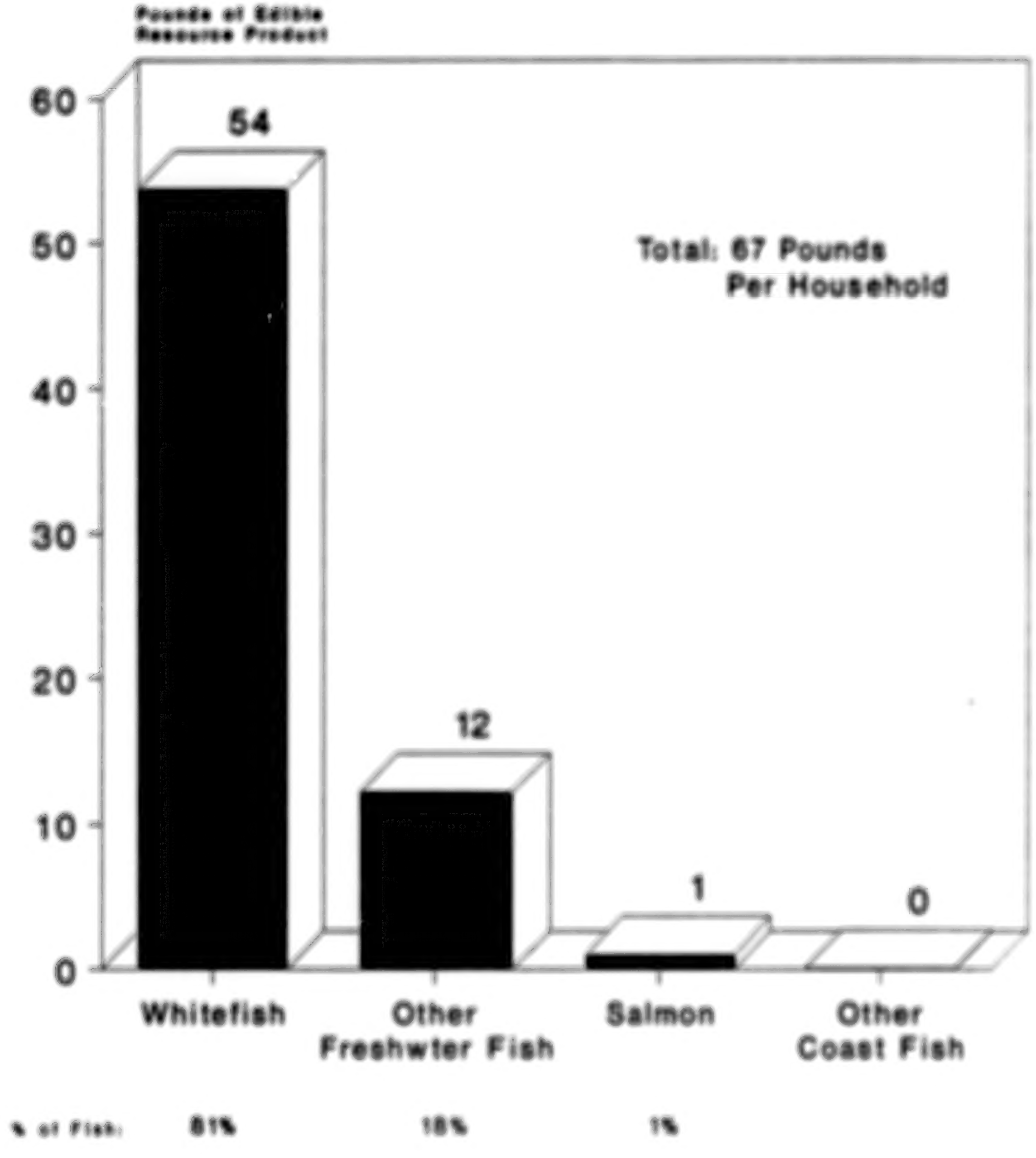
Figure 7 illustrates the relative importance of the four different fish harvest categories: whitefish, other freshwater fish, salmon, and other coastal fish. The majority of the Year One fish harvest was whitefish, providing 81 percent of the average household fish harvest in Year One. The whitefish catch included: round, broad, and humpback whitefish; arctic and Bering cisco; and least cisco. Other freshwater fish provided 18 percent of the fish harvest and included grayling, arctic char, burbot (or ling cod), northern pike, and lake trout. All five species of salmon indigenous to Alaska were reported by study households during Year One, although only pink salmon and chum salmon can be considered common in the Barrow area (Craig & LGL 1987). Other coastal fish harvested during Year One were limited to capelin and smelt.

Approximately one-fifth (22 percent) of all Barrow households harvested fish and the whitefish category showed the highest participation among the four fish categories. Concerning the individual species, Barrow households reported participating in grayling harvests more often than any other fish species. The overall sampling error as a percentage of the mean was 23 percent for the fish data. The total whitefish harvest estimate had the greatest reliability among the fish categories, while the non-specified whitefish and the broad whitefish harvest estimates had the greatest reliability among the individual species.

As illustrated by the monthly harvest data presented in Figure 8 and Tables 14 and 15, October yielded over twice as many fish as any other month during Year One. Thirty-nine percent of the fish harvest by weight occurred during October. August and September accounted for 18 and 16 percent of the total fish harvest, May accounted for 12 percent, while the remainder of the fish were caught during March, June, July, and November.

Whitefish were harvested May through November. The peak harvest was 17,332 pounds in October, when 34 percent of the whitefish harvest took place. Approximately 90 percent of the other freshwater fish were harvested in September and October. As can be seen in Table 15, the grayling catch far

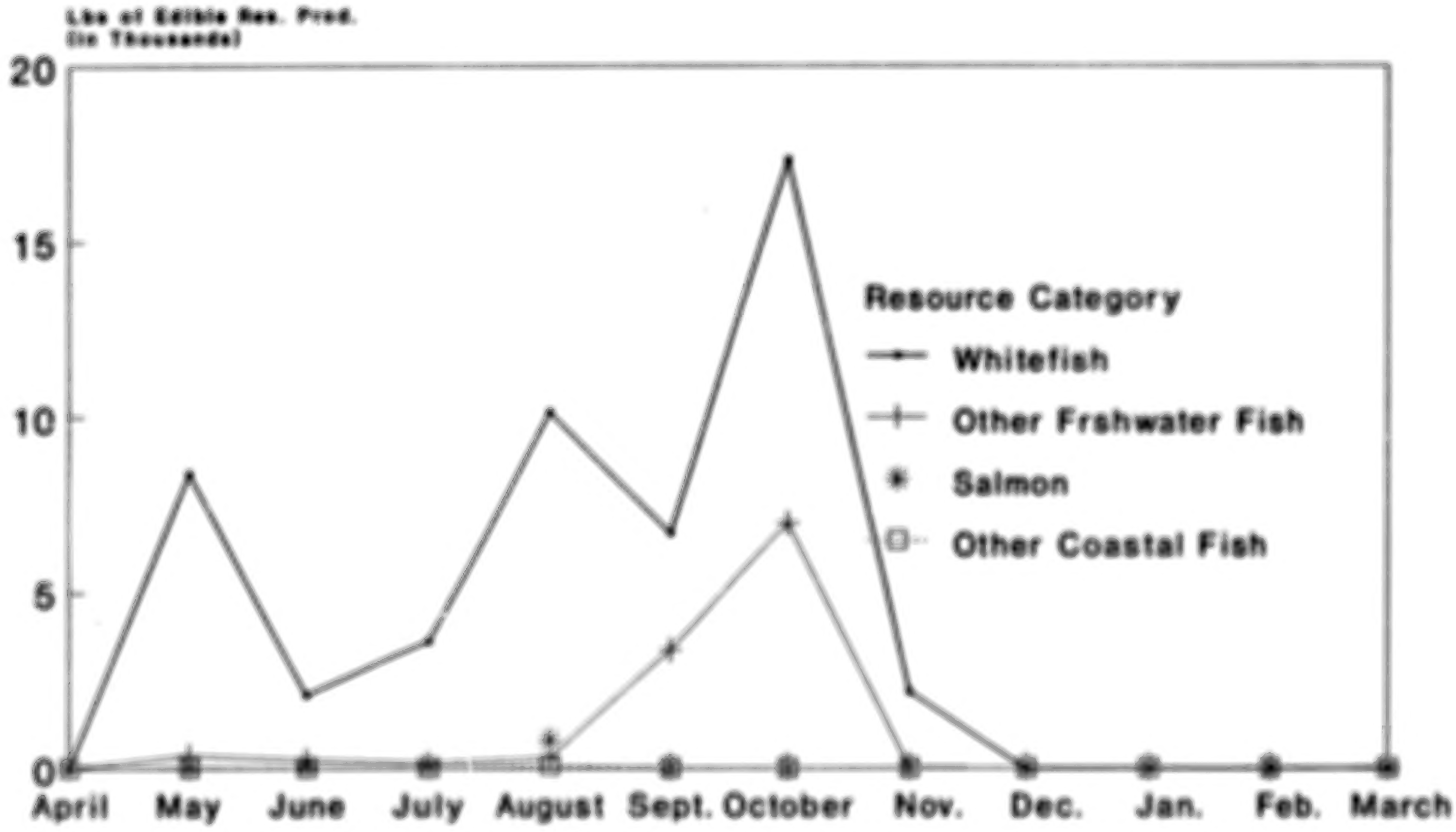
Figure 7: Harvest of Fish
All Barrow Households, Year One
(Mean Edible Pounds Per Household)



Source: Stephen R. Braund & Assoc., 1988

Figure 8: Monthly Harvest of Fish

All Barrow Households, Year One



Source: Stephen R. Braund & Assoc., 1988

TABLE 14: FISH HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Pounds of Edible Resource Product)

SPECIES	1987 April	May	June	July	August	TOTALS Sept.	October	Nov.	Dec.	1988 Jan.	Feb.	March
Total Whitefish	0	8,370	2,082	3,606	10,136	6,692	17,332	2,168	0	0	0	0
Whitefish (non-specified)	0	0	223	1,515	3,513	2,098	2,344	179	0	0	0	0
Round whitefish	0	0	670	0	287	254	692	0	0	0	0	0
Broad whitefish (River)	0	8,370	837	1,738	5,845	2,098	4,311	1,420	0	0	0	0
Broad whitefish (Lake)	0	0	0	0	0	1,340	1,203	569	0	0	0	0
Humpback whitefish	0	0	352	352	435	843	2,042	0	0	0	0	0
Least cisco	0	0	0	0	56	14	5,568	0	0	0	0	0
Bering, Arctic cisco	0	0	0	1	0	45	1,172	0	0	0	0	0
Total Other Freshwater Fish	0	357	241	150	286	3,372	6,993	13	0	0	0	65
Arctic grayling	0	0	241	150	260	2,489	4,361	0	0	0	0	0
Arctic char	0	44	0	0	22	29	3	0	0	0	0	0
Burbot (Ling cod)	0	312	0	0	4	850	2,253	0	0	0	0	65
Northern pike	0	0	0	0	0	0	5	0	0	0	0	0
Lake trout	0	0	0	0	0	4	371	13	0	0	0	0
Total Salmon	0	33	67	47	826	0	0	0	0	0	0	0
Salmon (non-specified)	0	0	0	0	371	0	0	0	0	0	0	0
Chum (Dog) salmon	0	0	0	0	31	0	0	0	0	0	0	0
Pink (Humpback) salmon	0	0	0	0	56	0	0	0	0	0	0	0
Silver (Coho) salmon	0	33	67	47	308	0	0	0	0	0	0	0
King (Chinook) salmon	0	0	0	0	60	0	0	0	0	0	0	0
Total Other Coastal Fish	0	0	0	0	67	0	0	0	0	0	0	0
Capelin	0	0	0	0	67	0	0	0	0	0	0	0
Rainbow smelt	0	0	0	0	0	0	0	0	0	0	0	0
All Fish Species	0	8,760	2,390	3,804	11,315	10,064	24,326	2,182	0	0	0	65

(Continued on next page)

TABLE 14, CONTINUED: FISH HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Pounds of Edible Resource Product)

PERCENTS

	1987									1988			
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	
Total Whitefish	0%	17%	4%	7%	20%	13%	34%	4%	0%	0%	0%	0%	= 100%
Whitefish (non-specified)	0%	0%	2%	15%	36%	21%	24%	2%	0%	0%	0%	0%	= 100%
Round Whitefish	0%	0%	35%	0%	15%	13%	36%	0%	0%	0%	0%	0%	= 100%
Broad Whitefish (River)	0%	34%	3%	7%	24%	9%	18%	6%	0%	0%	0%	0%	= 100%
Broad Whitefish (Lake)	0%	0%	0%	0%	0%	43%	39%	18%	0%	0%	0%	0%	= 100%
Humpback Whitefish	0%	0%	9%	9%	11%	21%	51%	0%	0%	0%	0%	0%	= 100%
Least cisco	0%	0%	0%	0%	1%	0%	99%	0%	0%	0%	0%	0%	= 100%
Bering, Arctic cisco	0%	0%	0%	0%	0%	4%	96%	0%	0%	0%	0%	0%	= 100%
Total Other Freshwater Fish	0%	3%	2%	1%	2%	29%	61%	0%	0%	0%	0%	0%	= 100%
Arctic grayling	0%	0%	3%	2%	3%	33%	58%	0%	0%	0%	0%	0%	= 100%
Arctic char	0%	45%	0%	0%	22%	29%	3%	0%	0%	0%	0%	0%	= 100%
Burbot (Ling cod)	0%	9%	0%	0%	0%	25%	65%	0%	0%	0%	0%	1%	= 100%
Northern pike	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	= 100%
Lake trout	0%	0%	0%	0%	0%	1%	95%	3%	0%	0%	0%	0%	= 100%
Total Salmon	0%	3%	7%	5%	85%	0%	0%	0%	0%	0%	0%	0%	= 100%
Salmon (non-specified)	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Chum (Dog) salmon	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Pink (Humpback) salmon	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Silver (Coho) salmon	0%	7%	15%	10%	68%	0%	0%	0%	0%	0%	0%	0%	= 100%
King (Chinook) salmon	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Total Other Coastal Fish	0%	0%	0%	0%	88%	0%	12%	0%	0%	0%	0%	0%	= 100%
Capelin	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	= 100%
Rainbow smelt	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	= 100%
All Fish Species	0%	14%	4%	6%	18%	16%	39%	3%	0%	0%	0%	0%	= 100%

Source: Stephen R. Braund & Associates, 1988

TABLE 15: FISH HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Number Harvested)

SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
	1987									1988		
Total Whitefish	0	3,348	1,258	1,595	4,612	2,932	11,500	824	0	0	0	0
Whitefish (non-specified)	0	0	112	758	1,757	1,049	1,172	89	0	0	0	0
Round Whitefish	0	0	670	0	287	254	692	0	0	0	0	0
Broad Whitefish (River)	0	3,348	335	695	2,338	839	1,725	568	0	0	0	0
Broad Whitefish (Lake)	0	0	0	0	0	394	354	167	0	0	0	0
Humpback Whitefish	0	0	141	141	174	337	817	0	0	0	0	0
Least cisco	0	0	0	0	56	14	5,568	0	0	0	0	0
Bering, Arctic cisco	0	0	0	1	0	45	1,172	0	0	0	0	0
Total Other Freshwater Fish	0	94	301	188	334	3,335	6,111	3	0	0	0	11
Arctic grayling	0	0	301	188	325	3,112	5,452	0	0	0	0	0
Arctic char	0	16	0	0	8	10	1	0	0	0	0	0
Burbot (Ling cod)	0	78	0	0	1	212	563	0	0	0	0	11
Northern pike	0	0	0	0	0	0	2	0	0	0	0	0
Lake trout	0	0	0	0	0	1	93	3	0	0	0	0
Salmon	0	6	11	8	137	0	0	0	0	0	0	0
Salmon (non-specified)	0	0	0	0	61	0	0	0	0	0	0	0
Chum (Dog) salmon	0	0	0	0	5	0	0	0	0	0	0	0
Pink (Humpback) salmon	0	0	0	0	16	0	0	0	0	0	0	0
Silver (Coho) salmon	0	6	11	8	51	0	0	0	0	0	0	0
King (Chinook) salmon	0	0	0	0	3	0	0	0	0	0	0	0
Total Other Coastal Fish	0	0	0	0	335	0	45	0	0	0	0	0
Capelin	0	0	0	0	335	0	0	0	0	0	0	0
Rainbow smelt	0	0	0	0	0	0	45	0	0	0	0	0

Source: Stephen R. Braund & Associates, 1988

66

exceeded that of any other species in the other freshwater fish category. The 137 salmon (824 pounds) harvested in August accounted for 85 percent of the total salmon catch by weight. The only harvest recorded outside the May through November period was the catch of burbot in March, considered locally to be especially desirable during the winter months.

Although fish contributed less than 10 percent of the total harvest by weight during Year One, based on study team field observations several considerations must be kept in mind when assessing the importance of contemporary fish harvests in Barrow:

- Dog teams, traditionally recipients of much of the fish harvest, are no longer common in Barrow. Of the approximately five dog teams in Barrow during Year One, field research determined that fish were not the main item in their diet. Thus, virtually all fish harvests in Year One were intended for human consumption.

- Fish harvest estimates are recalled less accurately than the estimates for larger species such as caribou, seals, or even geese and ducks. Large numbers of fish often are harvested in a short period (e.g., a two week-long fall fishing trip in October) and a harvester's estimate of his catch is often a best guess. In addition, the delineation of individual species is more difficult with fish. A single pull of the net in any of the local river systems could yield four or five different species of fish, e.g., broad whitefish, humpback whitefish, least cisco, and grayling. Char, salmon, arctic cisco, round whitefish, and burbot also could be caught in any of the local drainages. For Year One, the total number of fish harvested in each of the four major fish categories is more reliable than the number of individual species recorded.

- Some of the most active fishermen were the least candid about the amount of fish they harvested. Fish harvests, unlike any other local food resource, involve the participation of local households which, year after year, are consistent and major suppliers of the resource. Primarily five or six families, each with two or more camps spread out over the major river systems within the Barrow study area, attempted to catch enough fish to supply their extended families, to make generous contributions to the Thanksgiving and Christmas feasts, and to supply fish to those who desired them throughout the year. These families contributed a significant proportion of the total Year One community fish harvest; however they participated in the study with differing degrees of enthusiasm.

- Finally, an unknown quantity of fish were imported from nearby North Slope villages including arctic cisco from Nuiqsut, rainbow smelt from Wainwright, and broad whitefish and burbot from Atqasuk. Although fish harvest data were recorded when a study household member traveled to a North Slope village and actually participated in fish harvests, fish obtained through sharing, gifting or barter were not reflected in the harvest estimates. Field observations indicated that the latter means of obtaining fish were common in Year One.

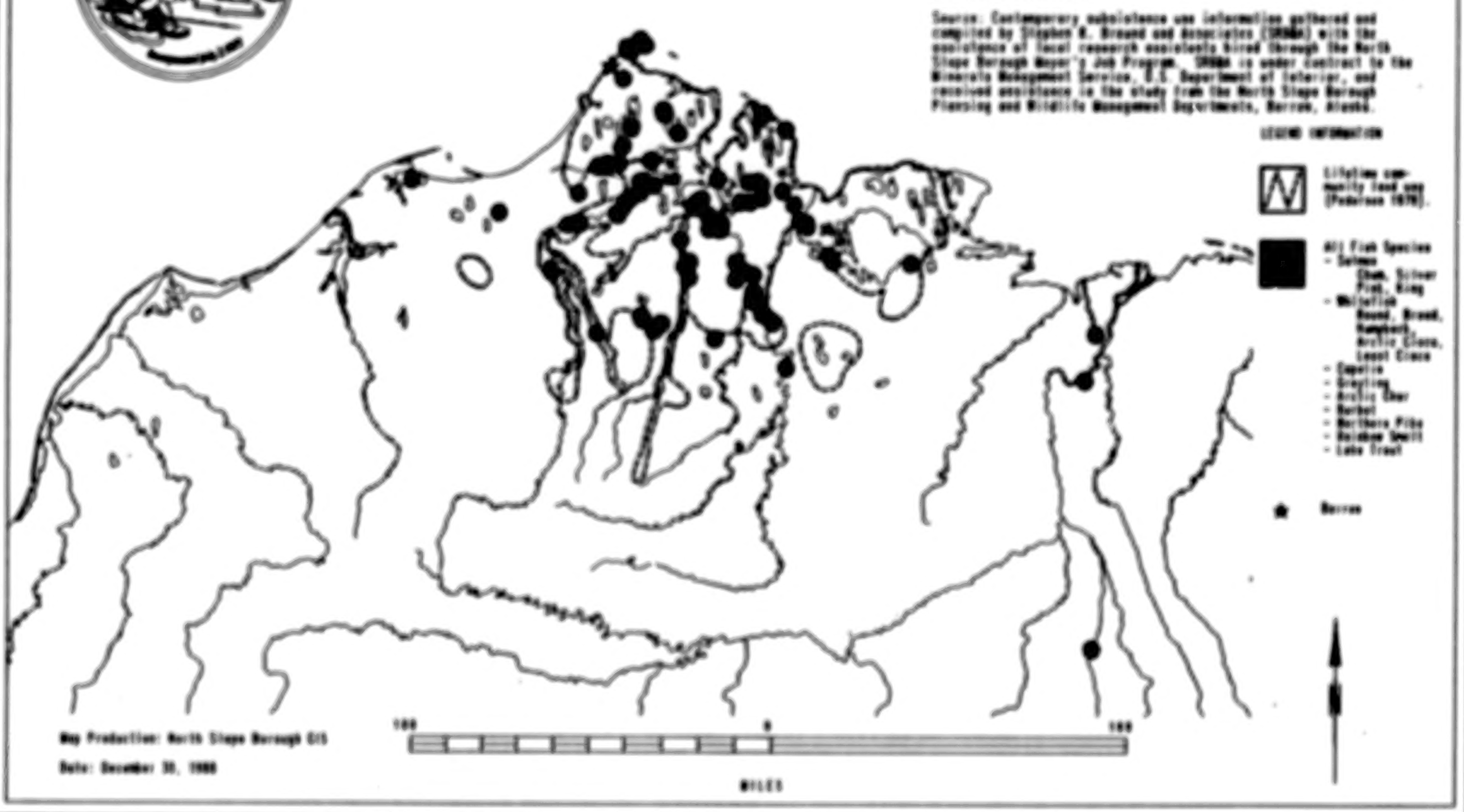
Maps 10 and 11 illustrate the fish harvest locations recorded during Year One. Map 10 shows Year One harvest locations for all fish species as well as life-time community harvest areas (Pedersen 1979) for fish. Contemporary fish harvest locations are very similar to those recorded in the 1970s. Notable exceptions are the harvests currently occurring in the vicinity of Peard Bay and in the Colville River drainage. In addition, some of the use area "islands" defined from Pedersen's (1979) research were not successful harvest areas for the study households in Year One. However, Barrow residents not in this study may have harvested fish in those areas during Year One.

Map 11 focuses on the primary harvest locations for the current study, illustrating the Year One fish harvest sites by species groups. The map clearly shows the orientation of Barrow fish harvests to the major rivers. Lake harvests are associated with Teshekpuk Lake, large lakes just south of Barrow, and numerous small lakes often located near the river-based fish sites. Harvest locations that do not appear to be near water are likely associated with small rivers and lakes not shown on the map. For example the Inaru River, flowing west to east approximately 25 miles south of Barrow, is a productive fishing stream that is not currently digitized in the GIS system. Salmon and other coastal fish generally were harvested in the vicinity of Barrow, primarily in Elson Lagoon.

MAP 10
NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE
FISH HARVEST SITES -- ALL SPECIES

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households (13 percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in this study. Lifetime-community harvest areas, collected in the form of map biographies from 26 Barrow households (Pedersen 1979), are also illustrated.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



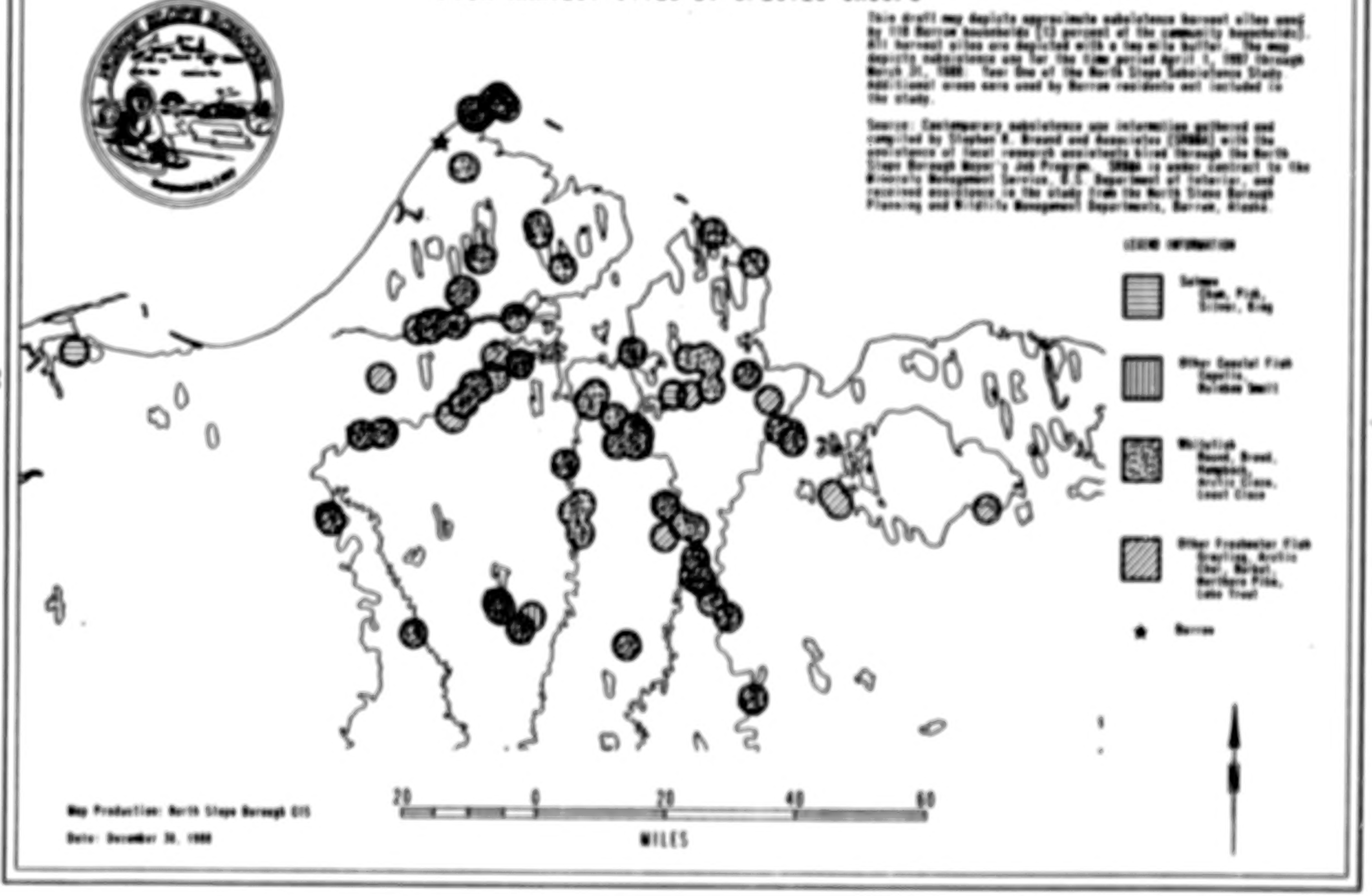
Map Production: North Slope Borough GIS

Date: December 30, 1988

MAP 11

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

FISH HARVEST SITES BY SPECIES GROUPS



This draft map depicts approximate subsistence harvest sites used by 110 Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two-mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRBA) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRBA is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.

LEGEND INFORMATION

▤ Salmon
Chum, Pink,
Silver, King

▥ Other Coastal Fish
Capelin,
Rainbow Smelt

▩ Whitefish
Round, Broad,
Humpback,
Arctic Cisco,
Least Cisco

▨ Other Freshwater Fish
Grayling, Arctic
Char, Burbot,
Northern Pike,
Lake Trout

★ Barrow

Map Production: North Slope Borough GIS

Date: December 30, 1988

Whitefish and other freshwater fish were harvested throughout the primary use area. Additionally, three Year One fish harvest sites are not shown on Map 11 due to the enlarged scale of this map. Grayling, arctic cisco, and non-specified whitefish were harvested at two locations near Nuiqsut and a grayling harvest was recorded due south of the above harvests on a tributary of the Colville River. These harvests are the three easternmost sites depicted on Map 10.

BIRDS

Figure 9 illustrates the relative importance of four distinct bird categories harvested during Year One. Geese accounted for over half (52 percent) of the bird harvest. Eiders contributed the second largest amount to the total bird harvest (38 percent), while ptarmigan account for approximately ten percent of the harvest. The contribution of other ducks to the total bird harvest is estimated at 112 pounds, providing less than one percent of the total bird harvest.

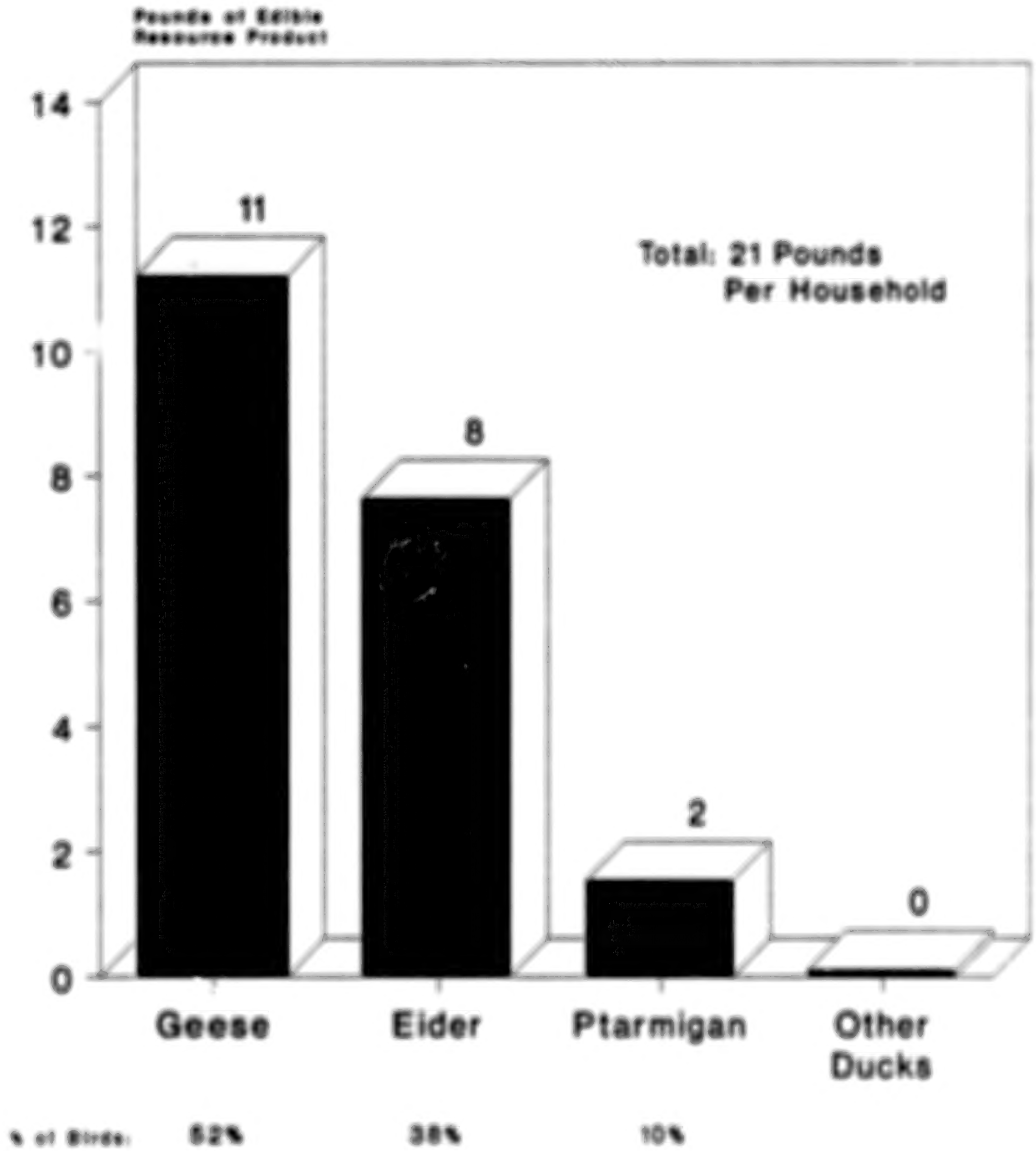
The total Barrow harvest of birds was approximately 19,214 pounds and contributed three percent of the total edible pounds of resources harvested by Barrow residents in Year One (Table 16). The average (mean) harvest per household was 21 pounds, with a range from 11 to 30 pounds harvested per household. The geese harvested were predominantly white-fronted geese augmented by a small number of black brant. The majority of eider harvests were reported simply as eiders. King eiders appear to be the most typical eider harvested, with spectacled and common eider harvested as well. The total number of all eiders harvested is more accurate than are the harvest numbers for individual species of eiders.

Willow ptarmigan was the only ptarmigan species reported by study households. A very low number of other ducks were harvested; they were not reported by species.

Figure 10 and Tables 17 and 18 break down the bird harvest by month. Birds were harvested between April and October. May was a peak harvest period with the total pounds harvested consisting primarily of white-fronted geese. Eiders

Figure 9: Harvest of Birds All Barrow Households, Year One

(Mean Edible Pounds Per Households)



Source: Stephen R. Braund & Assoc., 1988

TABLE 16: HARVEST ESTIMATES FOR BIRDS - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

RESOURCE	CONVERSION FACTOR (2) (Edible Weight Per Resource in lbs)	COMMUNITY TOTALS		AVERAGE POUNDS HARVESTED		PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	PERCENT OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	SAMPLING STATISTICS				
		NUMBER HARVESTED	EDIBLE POUNDS HARVESTED	PER HOUSEHOLD	PER CAPITA			STANDARD DEVIATION (lbs)	SAMPLING ERROR AT 95% (lbs)	LOW ESTIMATE (Mean lbs/ Household)	HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING ERROR AS % OF MEAN
Total Birds	n/a	n/a	19,214	20.51	6.4	3.2%	31.2%	5	10	10.61	30.40	48%
Total Geese		2,371	10,506	11.21	3.5	1.7%	17.3%	2	5	6.58	15.84	41%
Geese (non-specified)	4.5	327	1,472	1.57	0.5	0.2%	2.5%	1	1	0.46	2.68	71%
Brant	3.0	109	328	0.35	0.1	0.1%	1.6%	0	0	0.20	0.50	43%
White-fronted goose	4.5	1,935	8,707	9.29	2.9	1.4%	14.1%	2	5	4.72	13.87	49%
Total Eider		4,767	7,151	7.63	2.4	1.2%	19.1%	3	6	1.94	13.33	75%
Eider (non-specified)	1.5	4,663	6,995	7.47	2.3	1.1%	18.5%	3	6	1.77	13.16	76%
Common eider	1.5	17	25	0.03	*	**	0.4%	0	0	0.01	0.05	81%
King eider	1.5	85	128	0.14	*	**	0.7%	0	0	0.06	0.21	54%
Spectacled eider	1.5	2	3	0.00	*	**	0.1%	0	0	0.00	0.00	0%
Ptarmigan	0.7	2,066	1,446	1.54	0.5	0.2%	13.5%	1	1	0.48	2.60	69%
Other ducks (non-sepcif.)	1.5	73	110	0.12	*	**	2.8%	0	0	0.00	0.25	111%

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(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

* represents less than .1 pound

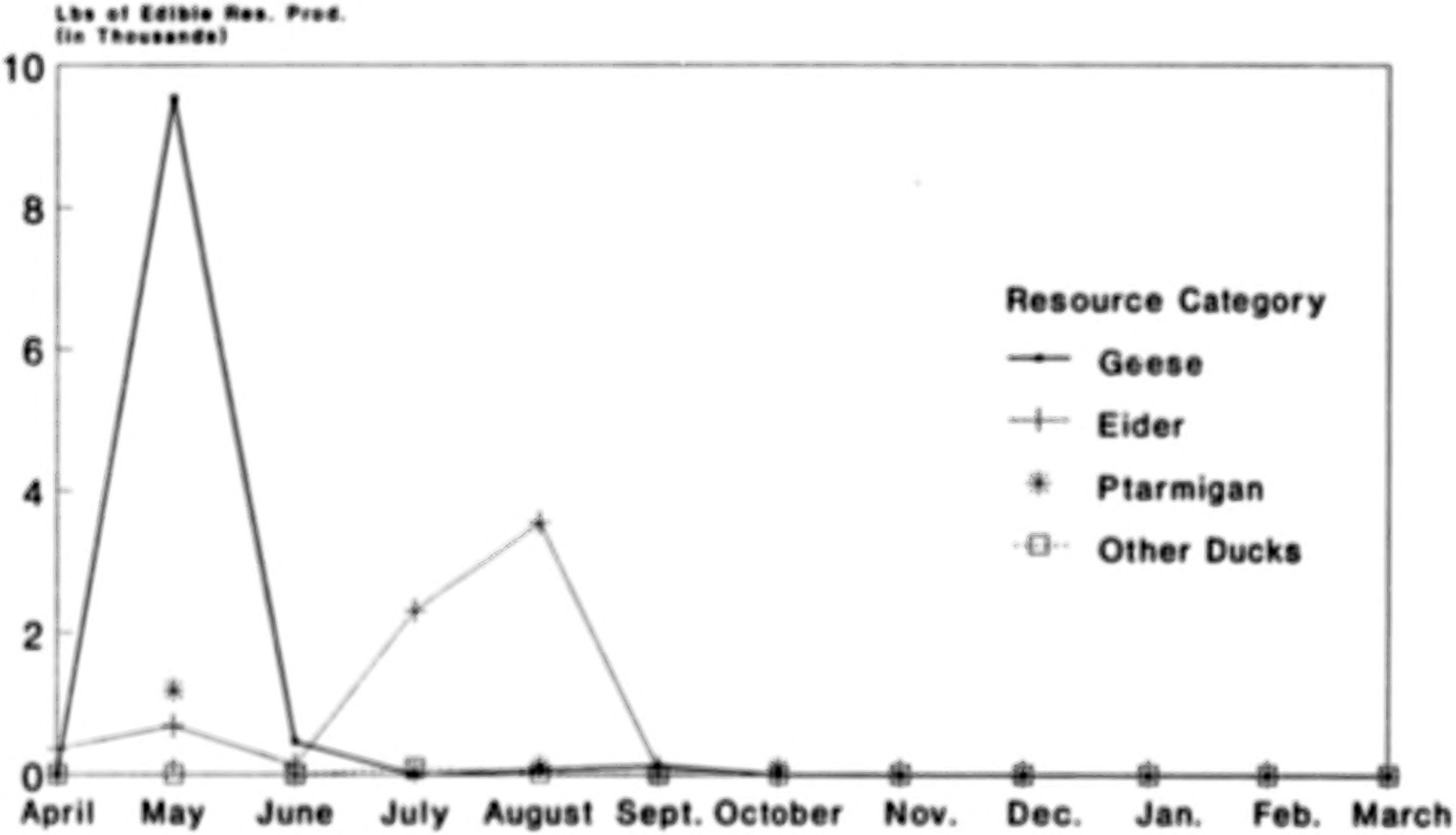
** represents less than .1 percent

n/a means not applicable

Source: Stephen R. Braund & Associates, 1988

Figure 10: Monthly Harvest of Birds

All Barrow Households, Year One



Source: Stephen R. Braund & Assoc., 1988

TABLE 17: BIRD HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE

(Pounds of Edible Resource Product)

TOTALS

	1987									1988		
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March
Total Geese	0	9,537	461	3	64	130	0	0	0	0	0	0
Geese (non-specified)	0	1,462	10	0	0	0	0	0	0	0	0	0
Brant	0	111	0	3	64	130	0	0	0	0	0	0
White-fronted geese	0	7,964	451	0	0	0	0	0	0	0	0	0
Total Eider	365	691	133	2,309	3,550	103	0	0	0	0	0	0
Eider (non-specified)	331	649	63	2,299	3,550	103	0	0	0	0	0	0
Common eider	17	8	0	0	0	0	0	0	0	0	0	0
King eider	17	34	67	10	0	0	0	0	0	0	0	0
Spectacled eider	0	0	3	0	0	0	0	0	0	0	0	0
Ptarmigan	0	1,194	0	43	116	8	84	0	0	0	0	0
Other ducks (non-specified)	0	0	0	95	15	0	0	0	0	0	0	0
All Bird Species	365	11,422	594	2,450	3,746	241	84	0	0	0	0	0

PERCENTS

	1987									1988			
SPECIES	April	May	June	July	August	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	
Total Geese	0%	94%	5%	0%	1%	1%	0%	0%	0%	0%	0%	0%	= 100%
Geese (non-specified)	0%	99%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
Brant	0%	36%	0%	1%	21%	42%	0%	0%	0%	0%	0%	0%	= 100%
White-fronted geese	0%	95%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
Total Eider	5%	10%	2%	32%	50%	1%	0%	0%	0%	0%	0%	0%	= 100%
Eider (non-specified)	5%	9%	1%	33%	51%	1%	0%	0%	0%	0%	0%	0%	= 100%
Common eider	67%	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
King eider	13%	26%	52%	8%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
Spectacled eider	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	= 100%
Ptarmigan	0%	83%	0%	3%	8%	1%	6%	0%	0%	0%	0%	0%	= 100%
Other ducks (non-specified)	0%	0%	0%	86%	14%	0%	0%	0%	0%	0%	0%	0%	= 100%
All Bird Species	2%	60%	3%	13%	20%	1%	0%	0%	0%	0%	0%	0%	= 100%

Source: Stephen R. Braund & Associates, 1988

TABLE 18: BIRD HARVEST BY SPECIES AND MONTH - BARROW, YEAR ONE
(Number Harvested)

SPECIES	1987 April	May	June	July	August	Sept.	October	Nov.	Dec.	1988 Jan.	Feb.	March
Total Geese	0	2,132	102	1	21	43	0	0	0	0	0	0
Geese (non-specified)	0	325	2	0	0	0	0	0	0	0	0	0
Brant	0	37	0	1	21	43	0	0	0	0	0	0
White-fronted geese	0	1,770	100	0	0	0	0	0	0	0	0	0
Total Eider	242	462	89	1,539	2,367	69	0	0	0	0	0	0
Eider (non-specified)	220	433	42	1,532	2,367	69	0	0	0	0	0	0
Common eider	11	6	0	0	0	0	0	0	0	0	0	0
King eider	11	23	45	7	0	0	0	0	0	0	0	0
Spectacled eider	0	0	2	0	0	0	0	0	0	0	0	0
Ptarmigan	0	1,706	0	62	166	11	121	0	0	0	0	0
Other ducks (non-specified)	0	0	0	63	10	0	0	0	0	0	0	0

Source: Stephen R. Braund & Associates, 1988

were harvested predominantly in July and August, with 82 percent of the eiders taken in those months. In September, a small number of eiders and geese were harvested as the birds continued to migrate west and south out of the study area. The ptarmigan harvest was greatest during May when 83 percent of the Year One harvest took place. The study households reported taking ptarmigan from May through October with the exception of June. June was a low harvest month for all bird species. According to key informants, most hunters do not take birds during the nesting season from early June through mid-July.

The areal range of bird harvests is similar to that determined by earlier research (Pedersen 1979), although Year One harvests tended to be concentrated near the central portion of the lifetime community harvest area (Map 12). Birds were also harvested off the coast of Barrow to a distance of five or more miles, a finding not reflected in the earlier research. These harvests consisted mostly of eiders hunted from boats or at the ice edge during May and June.

As can be seen in Map 13, eiders were harvested along the coast. The single "other duck" harvest location recorded in Year One was at the Shooting Station (Pigniq) near Point Barrow. Goose harvests were primarily oriented around the major rivers in the area, especially the Meade, Topagoruk, Chipp, and Ikpikpuk rivers. The majority of goose harvests took place within 50 miles of Barrow, although harvests did occur as far away as 80 miles. Ptarmigan harvest areas corresponded closely to those of geese and often both species were harvested during the same hunting trip, usually occurring in May.

OTHER RESOURCES

Other resources harvested accounted for less than one percent of the total edible pounds harvested during Year One (see Table 3). The resources in this category included bird eggs, blueberries, cranberries, salmonberries, wild rhubarb, snow, water, and ice. Harvest amounts for these resources were least likely to be recalled by the respondents during harvest discussions. Except for water and ice, which are measured in gallons, the pounds of other resources harvested were included in the calculation of total edible pounds harvested during Year One. However, maps and harvest estimates were not generated for the other resources items in the Year One report.

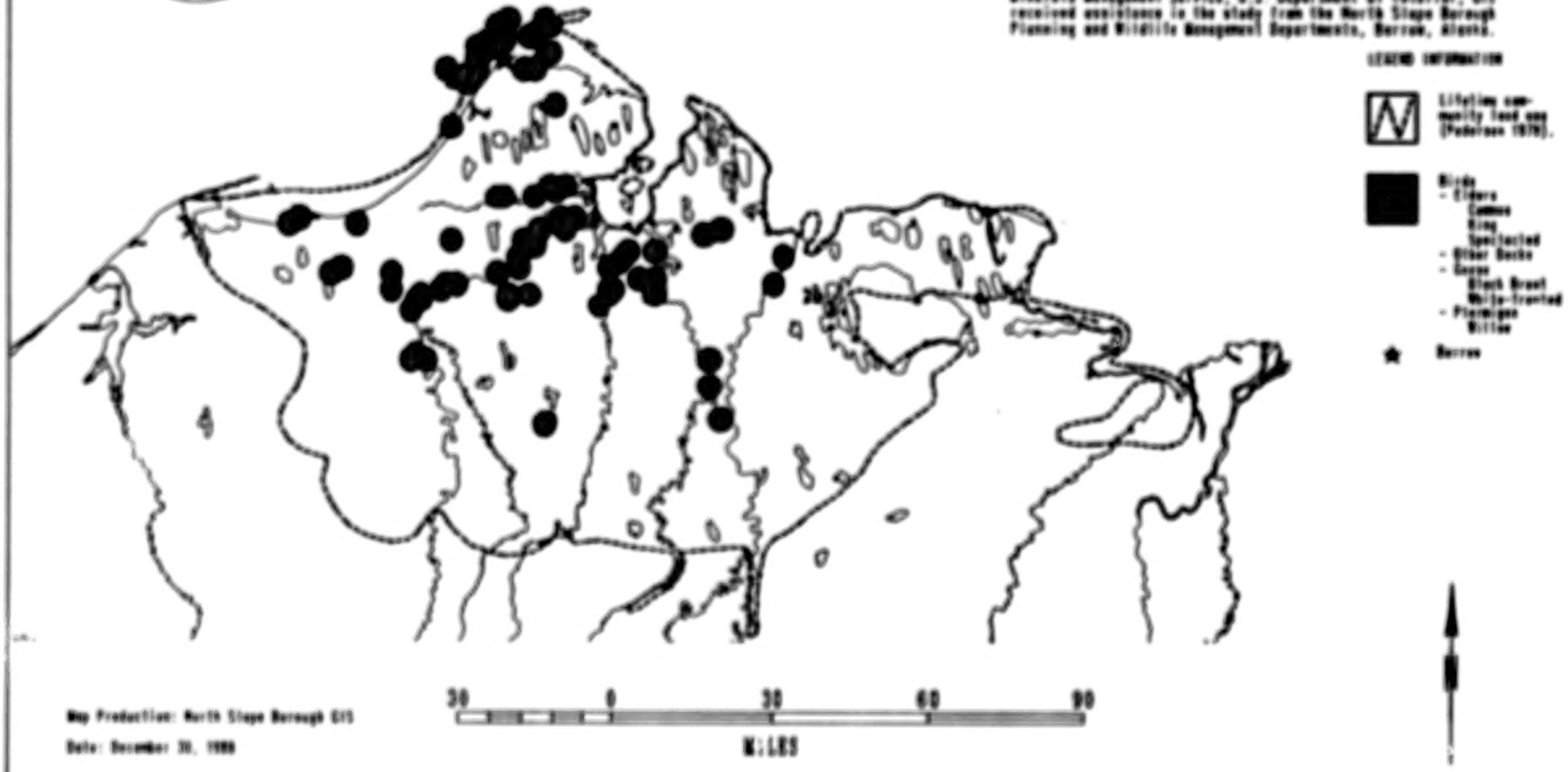
MAP 12

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

BIRD HARVEST SITES -- ALL SPECIES

This draft map depicts approximate subsistence harvest sites used by 118 Barrow households (13 percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in this study. Lifetime-community harvest areas, collected in the form of map biographies from 28 Barrow households (Pedersen 1979), are also illustrated.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.



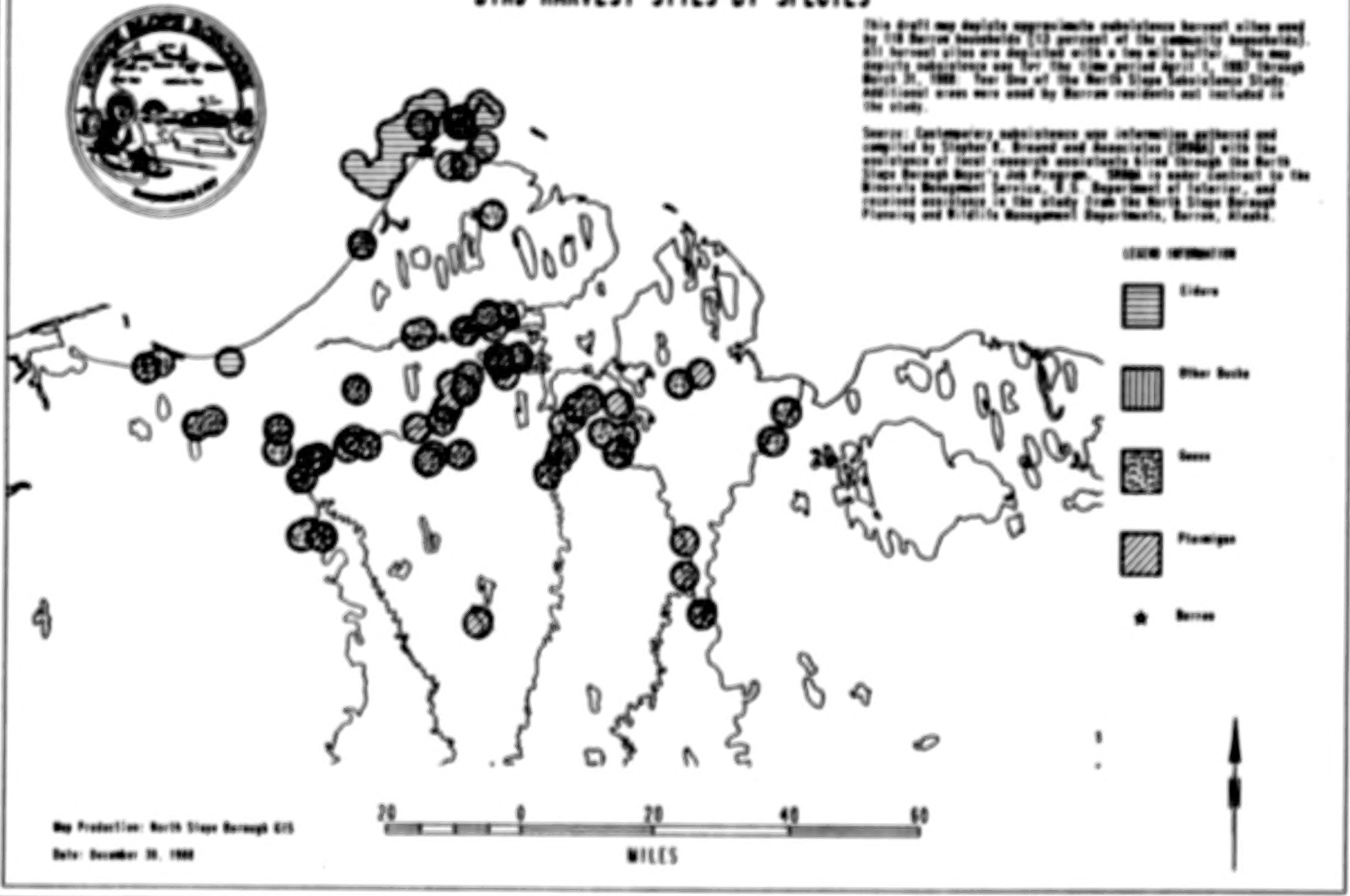
Map Production: North Slope Borough GIS

Date: December 30, 1988

MAP 13

NORTH SLOPE SUBSISTENCE STUDY - BARROW: YEAR ONE

BIRD HARVEST SITES BY SPECIES



This draft map depicts approximate subsistence harvest sites used by [illegible] Barrow households ([illegible] percent of the community households). All harvest sites are depicted with a two mile buffer. The map depicts subsistence use for the time period April 1, 1987 through March 31, 1988: Year One of the North Slope Subsistence Study. Additional areas were used by Barrow residents not included in the study.

Source: Contemporary subsistence use information gathered and compiled by Stephen R. Braund and Associates (SRB&A) with the assistance of local research assistants hired through the North Slope Borough Mayor's Job Program. SRB&A is under contract to the Minerals Management Service, U.S. Department of Interior, and received assistance in the study from the North Slope Borough Planning and Wildlife Management Departments, Barrow, Alaska.

Map Production: North Slope Borough GIS

Date: December 20, 1988

With the exception of water and ice, which many families depended on exclusively for their drinking water, harvest of these resources was usually incidental to other activities. Fresh water was a commonly harvested resource throughout the year. Many elders would not drink the city water, using it only for cooking and washing. Fresh water was collected as snow, water, and ice. The ice was often cut in blocks or chipped from lakes near the community. In addition, old sea ice (from which the salt has leached out) also was used as a source of drinking water, as were glacial icebergs when they were found trapped in the pack ice near town.

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APPENDIX: METHODOLOGY

The Appendix begins with a brief discussion of the purposes, objectives and goals of the North Slope Subsistence Study. This is followed by a detailed presentation of the methodology used to accomplish project goals and objectives. The methodology is presented in two main parts: sampling strategy and data collection.

GOALS AND OBJECTIVES OF THE STUDY

The primary objective of the North Slope Subsistence Study is to collect comprehensive community harvest data by species and location. Data on the extent of contemporary resource harvests and on the intensity of harvest activity on an area-wide basis have not been available prior to this study.

THE SAMPLING STRATEGY

The sampling strategy used for the first year of data collection in Barrow can be divided into three components: defining the sampling unit, selecting the sample (including modifications), and assessing the reliability of the sample.

Households as the Sampling Unit

Ideally, a study of this nature would observe the resource harvest activities of every village resident. However, such an endeavor in a community of approximately 3,000 residents was not economically or practically feasible. Therefore, the first task was to devise a method to limit the number of personal contacts required to obtain information that could be generalized to the entire Barrow population. A number of different sampling units were considered, including the individual harvester, the nuclear family, the household, and several different concepts of productive economic units revolving around the extended family. The advantages and disadvantages of each of these possible sampling units were assessed in terms of both time and cost efficiency and the overall goals of the project. After careful consideration the study team settled on the household as the sampling unit.

The household is a convenient, easily defined entity that has been used in past censuses and studies. Hence, data on the household level would allow easy comparison with previously collected data. The use of households as the sampling element, however, clearly involved compromises. Iñupiat communities place greater importance on the extended family as the primary social and economic unit than on the household or nuclear family. Consequently, contemporary Iñupiat households create somewhat artificial boundaries within the extended family that do not necessarily reflect functional or productive economic units. In fact, hunters generally function in groups that change in size and composition depending on the species sought, time availability, and kinship ties. These hunting parties generally divide the harvest among themselves such that, for many species, no individual hunter can report harvesting a discrete number of animals. This complicating factor of individual hunters banding together in dynamic functional groups was an important consideration in the allocation of harvest amounts to the individual households (see Data Coding and Processing below). Despite the disadvantages, the benefits of ease of implementation (i.e., more easily defined than economic units), efficiency (i.e., fewer sampling units than if individuals were used), and comparability (i.e., ability to compare results with other studies based on households) convinced the study team that the household was the best sampling unit.

Selecting the Sample

The study team chose a stratified sample design to identify a representative number of Barrow households to be included in the study. In a stratified sample, households are grouped into categories (strata). The particular form of stratified sample design employed in this study is called a "disproportionate stratified probability sample." Households in some categories were assigned a greater chance of being selected than households in other categories.

By using a disproportionate stratified probability sampling method, the study team was able to produce unbiased estimates of resource harvest activity that are more reliable than estimates that could have been generated from a comparably sized simple random sample or even from a comparably sized stratified sample in which sampling rates were constant across strata. In addition, the sampling approach employed in this study yields a sufficiently large sample of active resource harvest households to separately examine their harvest activity patterns and household characteristics.

In this study, the categories, or strata, were intended to correspond to different levels of resource harvest activity. The method for stratifying Barrow households was fairly simple and was based on a household member's own perceptions about the harvest of subsistence foods by their family. Five sampling strata were initially defined for Barrow corresponding to five possible answers to a question asked in a 1985 census of Barrow residents. The 1985 North Slope Borough census question read:

> How much of your own food would you say you and your family hunted, fished, or gathered for yourselves this year -- all of it, most of it, about half of it, some of it, or not any of it?

Assurances of confidentiality prevented the North Slope Borough from providing the study team with a list of households and their responses to the subsistence question. However, with the cooperation of the History, Language, and Culture Division within the North Slope Borough Planning Department, the households were stratified by their response to the above question, and a sample was drawn from each stratum using procedures which protected the confidentiality of responses to the 1985 census. The sampling technique is outlined as follows:

1) North Slope Borough planning staff used the responses to the census question to assign each household in Barrow to one of five categories (i.e., the five possible responses to the question).

2) They informed the study team of the number of households within each stratum. The study team used this information to provide the Borough with instructions on how to draw samples from each stratum. These instructions were applied to an alphabetized and numbered listing of households in each stratum. The instructions included the list number of the first household to be sampled and the number of households counted to reach the next sample household (i.e., the

sampling interval). For example, selection of every other household would occur with a sampling interval of two.

The sampling interval varied across the strata. The sampling interval ranged from two to 32 (i.e., every second household and every thirty-second household). A sampling interval of two was used to select households from the stratum including all households previously reporting that "all" their food came from subsistence harvest activities. A sampling interval of 32 was used to select households previously reporting that "not any" of their food came from subsistence harvest activities. Sampling intervals of four, six, and 12 were used in the intermediate strata.

3) Borough planning staff selected the sample from each stratum and combined the names of all selected households on a single alphabetized list. It was therefore not possible to infer a household's response to the 1985 census question from the final sample list.

4) North Slope Borough staff then contacted the sample households to describe the study and to request the cooperation of the household.

5) A member of the study team subsequently contacted each household that had agreed to participate in the study. At that time, researchers asked each household to answer the 1985 census question again and to explain their answer. Their responses helped the study team to assess the usefulness of the question in drawing future samples. Their response did not affect the chance the household had of being selected. Regardless of how a household's actual harvest level diverged from their 1985 response to the census question, the integrity of the sample was preserved; households were not reassigned to new strata.

One hundred and seven households (11 percent) did not respond to the 1985 census question used to stratify all households in Barrow. Households not responding to the question and households not asked the question because they did not exist in 1985 were assigned to a sixth sample stratum. Every sixth household in this stratum was selected.

The study team found that the word "family" was interpreted by some respondents in 1985 to mean the extended family unit. Some of these respondents harvested no subsistence foods themselves, depending exclusively on the harvests of relatives in another household. If these respondents reported that "all" their food came from the subsistence activities of their [extended] "family," they were included in the most active sampling stratum. Their inclusion in this stratum meant that they had a greater chance of being selected than the study team intended, since the effort expended to include them in the study would not significantly increase the reliability of harvest estimates for the community as a whole. The representativeness of the sample was not affected, however, since representativeness depends exclusively on a strict adherence to the rule of equal chance of selection within each stratum. This rule has been followed rigorously.

The fieldwork plan for Barrow data collection was designed with the understanding that the practical exigencies of fieldwork might require modifications to the original study design. During the first year of data collection, the study team learned that the original sample design would not reliably capture all harvest activities due to the concentration of some of these activities among a few households in the community. Therefore, the original sample design was modified in consultation with the MMS by adding a seventh stratum for those households that contribute substantially to the community harvest total. These households are "self-representing" in that all were selected for inclusion in the study, and it is not necessary to generalize their harvest figures to other households in Barrow. Table A-1 summarizes the final sample design.

All community households are grouped according to their strata assignment in the first column of data in Table A-1. The second column of data shows the number of households in each stratum. The third column shows the attempted sampling frequency for households in each stratum. In stratum one, for example, each household initially had a probability of one in one of being selected. A household assigned to strata six, in contrast, initially only had one chance in 32 of being selected. The number of households initially selected from each stratum is shown in the fourth column of data. Of the 149 selected households, 11 had moved from Barrow between the 1985 census and the beginning of the study. Thus, 138 households were eligible for selection.

TABLE A-1: SUMMARY OF SAMPLE DESIGN
BARROW, YEAR ONE

SAMPLE STRATA	NUMBER OF HH'S IN STRATA	ATTEMPTED SAMPLING FREQUENCY	INITIAL SAMPLE SIZE	FINAL SAMPLE SIZE	ACHIEVED SAMPLE FREQUENCY	SAMPLE WEIGHT
(1) WHALING CAPTAINS & OTHER HIGHLY ACTIVE HOUSEHOLDS	48	1 in 1	48	43	1 in 1	1.116
Strata based on response to 1985 Census Question						
(2) ALL FOOD	45	1 in 2	22	16	1 in 3	2.813
(3) MOST FOOD	67	1 in 4	17	13	1 in 5	5.154
(4) ABOUT HALF FOOD	85	1 in 6	14	11	1 in 8	7.727
(5) SOME FOOD	222	1 in 12	19	14	1 in 16	15.857
(6) NOT ANY FOOD	360	1 in 32	11	6	1 in 60	60.0
(7) UNKNOWN	110	1 in 6	18	15	1 in 7	7.33
TOTALS:	937		149	118		

Source: Stephen R. Braund & Associates, 1988

Twelve of the 138 households (nine percent) declined to participate in the study. During the course of the first year, eight of the remaining 126 households dropped from the sample -- either because the household dissolved (e.g., due to the death of the only household member), or because the household moved from Barrow during the study. The 118 households for which data are presented in the Year One report existed in Barrow for the entire year (column five shows the final number of sample households in each of the seven strata). While the exclusion of households which existed in Barrow for only part of the year results in community harvest averages that slightly overstate the true average harvests per household, the study team decided that the data generally would be interpreted to apply to permanent households and therefore should exclude households which only had an opportunity to contribute to the community harvest total for part of the year.

Column six shows the achieved sampling frequency for households in each stratum. In stratum two, for example, each household had a probability of one in three of being included in the final sample. In contrast, a household in stratum six had one chance in 60 of being in the final sample.

Column seven of Table A-1 displays the weights that are applied to sample data to properly represent community harvest totals. The weights are calculated by dividing the total number of households in each stratum by the final number of sample households in each stratum.

Reliability of The Barrow Sample Results

As discussed above, the Barrow sample was designed as a disproportionate stratified probability sample. Strata associated with higher levels of expected harvest activity were sampled with higher selection probabilities. The intent of this procedure was to increase the reliability of sample results over that expected from a simple random sample or even a stratified sample in which each stratum was sampled with the same probability.

To estimate the reliability of the sample it is necessary to know something about the mean and variance of specific results by strata. The means and variances displayed in Table A-2 (a copy of the same table was introduced in the main body of the text as Table 3) are properly "weighted" to take into

TABLE A-2: TOTAL HARVEST ESTIMATES BY MAJOR RESOURCE CATEGORY - ALL BARROW HOUSEHOLDS, YEAR ONE (1)

	CONVERSION FACTOR (2)	COMMUNITY TOTALS		AVERAGE POUNDS HARVESTED				SAMPLING STATISTICS				
RESOURCE	(Edible Weight Per Resource in lbs)	NUMBER HARVESTED	EDIBLE POUNDS HARVESTED	PER HOUSEHOLD	PER CAPITA	PERCENT OF TOTAL EDIBLE POUNDS HARVESTED	PERCENT OF ALL BARROW HSEHOLDS HRVSTING RESOURCE	STANDARD DEVIATION (lbs)	SAMPLING ERROR AT 95% (lbs)	LOW ESTIMATE (Mean lbs/ Household)	HIGH ESTIMATE (Mean lbs/ Household)	SAMPLING ERROR AS % OF MEAN
Marine Mammals (3)	n/a	n/a	327,182	349	108.5	54%	35.1%	27	53	296	403	15%
Terrestrial Mammals	n/a	n/a	199,058	212	66.0	33%	26.4%	27	54	159	266	25%
Fish	n/a	n/a	62,895	67	20.9	10%	22.1%	8	16	51	83	23%
Birds	n/a	n/a	19,214	21	6.4	3%	31.2%	5	10	11	30	48%
Other Resources	n/a	n/a	266	0.3	0.1	**	2.9%	0	0	0	1	170%
Total (3)	n/a	n/a	608,525	649	201.8	100%	49.4%	47	92	557	742	14%

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(1) Estimated sampling errors do not include errors in reporting, recording, and in conversion to usable weight.

(2) See Table A-4 for sources of conversion factors.

(3) Bowhead harvest does not contribute to the sampling error for marine mammals since the bowhead harvest is based on a complete count.

** represents less than .1 percent

n/a means not applicable

Source: Stephen R. Braund & Associates, 1988

account the different probabilities of selection between strata. They are derived from the means and variances of the separate strata. The mean pounds harvested by each stratum for a given resource category (e.g. marine mammals) was calculated as follows:

$$\bar{y}_{h} = \frac{1}{n_h}\sum_{i}^{n_h} y_{hi}$$

where: y_{hi} is the number of pounds harvested by household "i" in stratum "h".

n_h is the number of households in stratum "h".

The variance of the mean for each stratum was calculated as follows (Kish, 1967, p.81):

$$\mathrm{var}(\bar{y}_{h}) = (1 - f_h)\frac{s_h^2}{n_h}, \qquad \text{where } s_h^2 = \frac{1}{n_h - 1}\left(\sum_{i}^{n_h} y_{hi}^2 - \frac{y_h^2}{n_h}\right).$$

The weighted mean was calculated as follows (Kish, 1967, p.81,3.3.1):

$$\bar{y}_{w} = \sum_{h}^{H} W_h \bar{y}_{h} = \sum_{h}^{H} W_h \frac{1}{n_h}\sum_{i}^{n_h} y_{hi}$$

where: W_h is the relative size of stratum "h", in this case expressed as the proportion of all households in the community assigned to stratum "h" for sampling purposes.

In the case of marine mammals, the weighted mean is 349 pounds per household.
It was also necessary to combine the variances of the stratum means (Kish, 1967 p.81,3.3.2):

$$\mathrm{var}(\bar{y}_{w}) = \sum W_h^2(1 - f_h)\frac{s_h^2}{n_h}.$$

where: f_h is the sampling fraction (row 4 of Table 1) of stratum "h".

In this case, the weighted estimated variance of the sample mean is 740.38. The estimated standard deviation of the mean is the square-root of 740.38, or 27.21. The standard error can be used to express the reliability of sample results as a confidence interval around the sample mean. At a 95 percent level of confidence, the sampling error of the mean estimated pounds of marine mammals harvested between April 1, 1987 and March 31, 1988 is 1.96 times the standard deviation, or:

349 Lbs. ± (1.96)*(27.21) Lbs., or 53 Lbs.

Differences in harvest activity patterns result in differences in the reliability of sample means across harvest categories. The best way to compare the reliability of sample means is to examine the sampling errors as percentages of their respective means. The last column of data in Table A-2 compares these figures for the major resource categories. The reliability of the sample means for marine mammals, terrestrial mammals, fish, and all resources combined is consistent with those achieved by other studies of harvest activity employing disproportionate stratified sampling techniques (Kruse 1988). The sample means for birds and other resources are of lower reliability. Note, however, that these resource categories contribute relatively little to the overall community harvest.

DATA COLLECTION AND DATA PROCESSING

The primary study objective (i.e., community representative subsistence harvest data by species and location) has been achieved in Barrow through regular contact with members of 118 Barrow households. Over 1,600 individual harvest events were recorded during Year One (April 1, 1987 through March 31, 1988). The harvest information gathered during the informal household discussions was systematically recorded on one-page forms and blueline copies of USGS 1:250,000 maps. Each event became a record of data that was added to the SPSS/PC+ data set in the SRB&A Barrow office. Harvest locations were also transferred to base maps in Barrow. The base maps were then sent to the North Slope Borough Planning Department's Geographic Information Systems (GIS) Anchorage office where NSB staff digitized the harvest locations and prepared harvest area maps for this report.

The researchers have also been assembling household data during Year One that will describe the role of subsistence activities in the lives of Barrow residents. Average household size and the ethnic classification of households are the only variables from the household data pertaining to the harvest data presented in this report.

The following discussion explains in more detail the procedures and techniques the study team used to collect, code, record and process the Year One subsistence harvest data.

Data Collection Methods

The study team employed two main methods of collecting the data for this project: informal key informant discussions and participant observation.

Key Informant Discussions

The basic harvest data were collected during periodic visits with each sample household. During each visit, the key informant reported the harvest activities of household members. Primary data items reported by species were harvest site and number killed. Key informants also reported (if available): the sex of the species harvested, which household members participated in the harvest activity, total number of household members present during the harvest trip, and the total number of non-household members participating in the harvest activity. Finally, researchers also recorded any anecdotal information regarding weather, comparisons with previous harvests, observations on animal health or populations, or similar topics.

The researchers recorded the harvest activity data either in field notebooks or directly on the data coding forms. The household's harvest locations were marked directly onto maps by the researcher or, occasionally, by the harvesters themselves. Each map used to identify harvest areas included a legend block for identifying the household and harvest period. The same identification variables appear on activity record forms (discussed in detail below). The mapped information was collected on blueline USGS 1:250,000 scale topographic maps. The map most frequently used was a blueline composite of nine USGS maps. SRB&A and the MMS developed the Barrow Area Base Map to encompass the geographic area most commonly used by Barrow hunters.

Field researchers attempted to discuss each household's harvest activity with the most active hunter in the household. If he (or she) was unavailable, they contacted another household member who was present during the harvest. Occasionally a household member who was not present during the harvest would

92

provide information about the recent harvest activities of the household members. In these cases, field staff later contacted the participating harvesters to verify the data and/or to obtain any missing information.

Infrequently a harvester did not know exactly where the harvest took place. In most instances, however, the harvester was able to refer the researcher to a member of the harvest group who could identify the harvest location.

The average number of successful harvest discussions per household for Year One was 5.8, with a range from one to 12. The total number of Year One harvest discussions per month for the entire sample of 118 households ranged from 34 in February to 72 in November, and the total number of successful harvest discussions for the year was 685. These figures do not include the numerous attempts that often were involved in locating and contacting the respondent before completing a successful harvest discussion, but do include one Year Two visit (i.e., a visit that occurred after March 31, 1988) per household during which harvests through the end of Year One (March 31, 1988) were recorded.

The actual frequency with which a household was contacted depended primarily on two factors: the observed level of activity during the first few months of data collection and seasonal variation in the household's harvest activity level. Additionally, other factors affected the frequency of contact, such as bad weather, cultural events, difficulty locating and engaging participation of some respondents, and staffing problems. During Year One, a typology of household harvest activity levels emerged, with some households being non-harvesters, others being very active harvesters, and the majority being somewhat active depending primarily on the season of the year. Those who were inactive required very few visits while those who were very active required visits as often as bi-weekly (every two weeks) during their most active periods.

Field observations indicated that household harvests varied by season. Many households fished and hunted caribou in the fall, while others did not. Some households resided at camp for part of the summer, constituting their subsistence activities for the entire year. While full-time work did not prevent most hunters from hunting in the evenings and on weekends, others hunted only during vacations and leave time taken in the spring and fall. Once

93

the general household pattern was determined, the frequency of visits was adapted to fit with the level and timing of the household's harvest activities.

An unfavorable response to the bi-weekly visits initially attempted necessitated, for some households, less frequent contact in order to maintain these households in the study. Other households viewed the study more favorably when the visits corresponded with their active periods rather than occurring arbitrarily.

Finally, many of the respondents quickly memorized the short set of questions repeatedly asked about their harvest activities. Recall appeared to be enhanced significantly through this process (an impression based on the ease versus the difficulty a respondent would have in reporting their data). About ten percent of the active households also began recording their harvests and harvest locations on their own (e.g., on a calendar or sheet of paper). Thus, while maintaining regular contact was integral to the success of the study, the high contact frequency rate initially envisioned for this study (i.e., bi-weekly visits for active harvesters) was not necessary; moreover, bi-weekly visits were not well received by respondents.

As stated above, the study team attempted to increase the contact frequency for more active households during particularly active harvest periods in order to minimize hunter recall problems. However, the most active harvesters were typically the most difficult to contact during the busy hunting times. They were either spending all their free time hunting or they were residing at their camps away from Barrow. The solution to the first problem was to contact the active hunter briefly during busy periods to gather as much harvest data as possible. The remainder of the information was filled in later when he was available for a more lengthy discussion.

In an attempt to solve the second problem, active harvesters who were residing at their hunting and fishing camps during peak hunting and fishing times, the study team experimented with self-reporting of harvests by providing three households with subsistence harvest journals and maps to take to camp with them. The respondents used the journals to record the species, the amount harvested, the date, and usually the sex of the animal(s) harvested. Remaining information (e.g., location and participants) was obtained in a subsequent harvest discussion with the household. Compared to respondents who did not use camp journals, the journals appeared to be most useful for enhancing the recall of harvest dates and species' sex, and should be particularly valuable for obtaining complete harvest data for households who reside at camp for three months or more. The study team planned to request that additional households keep camp journals during Year Two.

Participant Observation

Tim Holmes, the SRB&A field coordinator, resided in Barrow throughout Year One. Holmes' full-time presence in the community provided him ample opportunity for participant observation at various subsistence related activities and events. Braund, Burnham, and Stoker were also involved in participant observation. The most important participant observations occurred:

- during preparation for spring whaling and at whaling camps on the ice;
- at whale harvest locations;
- while whaling crew shares were distributed at captains' homes;
- during the Nalukataq celebrations;
- when bearded seal was butchered and hung to dry;
- a two week stay at a fall fishing and caribou hunting camp on the Meade River.

Participant observation improved the accuracy of the data collection in a number of ways. Most importantly, it provided the opportunity to continually field check the data collection rules and methods. Researchers directly observed, for example: how harvests were divided among hunters; how harvests were counted and weighed; and how hunters approached the task of locating harvest resources. The experience gained in these situations was applied to a modification of data coding and entry rules. In addition, the training program for the research assistants was subsequently improved to handle unique harvest reports.

Data Coding and Processing

To obtain the desired data on resource harvest activities, the study team set

95

out to document each separate resource harvest activity undertaken by each household member. Thus, a single resource harvest activity is one of the two primary recording units for the study; the household is the other main recording unit. The harvest data consist of attributes descriptive of the specific harvest event: date, time, species, amount harvested, location, and participants. The specific definitions of these variables are presented below.

The Household

The household is conceptually defined for the purposes of data collection to consist of the people who sleep in a sampled dwelling (e.g., house or apartment). Anyone living in a sample household at the time a resource harvest occurs is treated as a member of the household. If, for example, a daughter normally living in Anchorage visits her parents at fish camp and helps tend the nets, she is recorded as one of the participants in the resource harvest activity. This approach produces data that are generalizable to households whose compositions may change over time.

The Harvest Activity

The definition of a single resource harvest activity for recording purposes is a species-specific harvest at a particular location during no more than a two week period by one or more members of a sample household. The activity must be species-specific but can include the harvest of two or more of the same species. Hunting or fishing activities which do not result in a harvest are not recorded.

The particular location of a harvest activity is important to the assessment of OCS effects. Although the incidence of many OCS effects may be difficult to predict, the geographic location of land-based activities such as supply bases and pipelines could have significant effects on subsistence harvest activity. A "particular" location is defined as a hunting or fishing area that can be readily differentiated from other locations on a 1:250,000 scale map.

While recording the actual date of harvest is desired, in some cases this goal was not possible. When a respondent was vague about a date, the interviewer showed him or her a calendar to prompt a more specific response. In some

96

cases, this tool effectively elicits a specific date, while in other cases it serves to simply narrow the harvest date down to a particular week. Camp-based harvest activities were treated slightly differently since asking informants to recall their opportunistic hunting and fishing activities on a daily basis while at camp proved impractical. Therefore, for camp-based harvests occurring more or less continuously (e.g., fish nets under the ice), respondents were asked to report their overall harvest of a specific species in a two week period rather than asked to recall their catch on a daily basis. The implication of the two week time limit on a single resource harvest activity is that the maximum error in reporting a harvest date is two weeks. In most cases, however, the record date matches the actual harvest date.

The above definition of a single resource harvest activity produces the following results:

(1) The harvest of two species at the same location on the same trip generated two observations.

(2) The harvest of two or more of the same species at the same location on the same trip generated one observation (with the harvest amount recorded as part of the observation).

(3) The harvest of the same species at two locations on the same day generated two observations.

(4) The harvest of the same animal at a single location by two members of a household generated one observation (with household members participating recorded as part of the observation).

(5) The harvest of the same animal by single members of two different households generated two observations. The amount recorded in this instance, or in the case of any shared harvest, is a value proportionate to the individual's share of the harvest. If the individual's share was a fraction of an animal, then that fraction was recorded to the nearest tenth of a percent.

Recording Units

The harvest activity and the household were the two recording units for quantitative data. They formed the organizational basis for gathering, storing, and analyzing the data collected through key informant interviews from the sample households. Data coding forms were developed for both recording

97

units. The data items recorded on each form are considered attributes. Figure A-1 displays the Harvest Activity Sheet and below is a complete description of each attribute.

Harvest Activity Sheet

The Harvest Activity Sheet can be used to record six different harvest events (records) by a specific household. In addition to recording the attributes of each harvest event, the sheet is designed to easily match the data with sample households, to enable the field coordinator to keep track of the source of the data (i.e., who performed the interview, who in the household was interviewed, the beginning and end dates of the recording period represented by the form, and the date of the interview), and to permit the calculation of field statistics such as the cumulative number of contacts for the year for each of the sample households and the total number of households contacted.

Interviewer ID: A unique two digit numeric code. With more than one interviewer present, the ID number of the senior interviewer is coded.

Household ID: A three digit numeric code for each household. This is a unique number assigned to each household so that resource harvest activity records can be aggregated by household and linked to household characteristics.

HH Contact ID: A two digit numeric code. If more than one household member answered questions, the household member responsible for the greater amount of actual harvesting is coded.

Begin Date: A set of three two digit numeric codes representing the beginning month, day and year covered by the harvest activity sheet. The begin date should be continuous with, but not overlapping, the last contact date or two week period.

End Date: A set of three two digit numeric codes representing the last month, day and year of the recording period.

Today's Date: A set of three two digit numeric codes corresponding with the month, day and year of the interview. This date corresponds with the end date in most cases. The only exceptions are those interviews in which harvest dates are unknown and the "two week rule" is in effect.

Entry ID: A unique five digit numeric code attached to every successful harvest record. These values are assigned sequentially at the time of coding and are marked in four places: 1) On the harvest activity sheet next to the successful harvest record; 2) on the

FIGURE A-1: HARVEST ACTIVITY SHEET

HARVEST ACTIVITY SHEET

RESEARCHER ID ________ BEGIN DATE ________

HOUSEHOLD ID ________ END DATE ________

HH CONTACT ID ________ TODAY'S DATE ________

ENTRY ID	MAP ID	DATE	SPECIES/ RESOURCE HARVESTED	AMOUNT/NUMBER HARVESTED			ESTIMATED SIZE OR # OF SACKS	TIME IN FIELD		HH HARVESTERS					NO. OF HHOLD PARTIC.	NO. OF NON-HH PARTIC.	COMMENTS:
				TOTAL	M	F		HRS	DAYS	INDIVIDUAL ID #s							

original map adjacent to the corresponding Map ID (described below); 3) on the compiled harvest map going to GIS; and 4) in the SPSS file.

Map ID: A two digit numeric code corresponding to mapped harvest locations. A value of 97 signifies that the harvest is related to whaling and a value of 95 signifies that the actual harvest location was not mapped but an estimated location was assigned the harvest.

Date: A set of three two digit numeric codes representing the month, day and year covered by the particular harvest record or case.

Species/Resource Harvested: A unique three digit numeric code representing all species and resources used by Barrow residents. Table A-3 is a species and resource list that includes all the resources Barrow residents are known to have harvested in the past as well as the number used to code each species. The species are divided into resource categories. The first code under each category is inclusive of all species in that group and is to be used when the particular species is unknown. The numbering system is not sequential so as to allow for the addition of other species in the different categories if they are encountered.

Amount/Number Harvested:

Total: A one to three digit, one decimal numeric code representing the total amount of a given resource harvested. In all cases but water, ice, snow and berries this value shall represent the number of animals harvested. For any form of water or berries this number will be represent the number of gallons harvested.

Male: Same as above except only males are coded. No effort is made to sex waterfowl or fish.

Female: Same as above except only females are coded. No effort is made to sex waterfowl or fish.

Estimated Size or Measurement: A four digit numeric code that represents the amount in pounds of a given resource harvested. This column is left blank until conversion tables can be refined from both existing data and data collected in the field. Coding will be done at a later date. Information that will assist in this conversion is coded under Comments (see below).

Time in Field:

Hours: A one or two digit numeric code representing the hours the hunter spent away from Barrow pursuing this harvest. Can be used independently of Days for any trip under 24 hours, but should be used in conjunction with Days for trips longer than 24 hours. That is, a 26 hour trip would be represented as 2 HRS and 1 DAY.

Days: A one or two digit numeric code representing the number of days the hunter spent away from Barrow in this harvest activity. Used in conjunction with HRS above.

Household Harvesters: A series of two digit numeric codes (unique within each household) that represents the household members who actually participated in the harvest. If more than five members of the household participated in an event, the five members who where most active in the event are coded.

TABLE A-3: BARROW SPECIES CODING LIST

Species	Iñupiaq Name	Scientific Name	Code
Big Game			001
Caribou	Tuttu	Rangifer tarandus	002
Moose	Tuttuvak	Alces alces	003
Brown bear	Akłaq	Ursus arctos	004
Musk Oxen	Umiŋmaq	Ovibos moschatus	005
Dall sheep	Imnaiq	Ovis dalli	006
Marine Mammals			010
Seal			011
Bearded seal	Ugruk	Erignathus barbatus	012
Ringed seal	Natchiq	Phoca hispida	013
Spotted seal	Qasigiaq	Phoca largha	014
Ribbon seal	Qaiġulik	Phoca fasciata	015
Whale			020
Beluga whale	Qiļalugaq	Delphinapterus leucas	021
Bowhead whale	Aġviq	Balaena mysticetus	022
Polar bear	Nanuq	Ursus maritimus	025
Walrus	Aiviq	Odobenus rosmarus	026
Furbearers, Small Game			030
Fox			031
Arctic (Blue) fox	Tiġiganniaq	Alopex lagopus	032
Red fox	Kayuqtuq(Qiangaq)	Vulpes fulva	033
Cross fox	Qiangaq	Vulpes fulva	033
Silver fox	Qiugniqtaq	Vulpes fulva	033
Arctic Hare	Ukalliq	Lepus arcticus	036
Snowshoe hare	Ukalliq	Lepus americana	037
Lynx	Niutuiyiq	Felis lynx	038
Hoary marmot	Siksrikpak	Marmota caligata	039
Porcupine	Qiŋaġluk	Erethizon dorsatum	040
Ground squirrel	Siksrik	Spermophilus parryii	041
Wolf	Amaġuq	Canis lupus	042
Wolverine	Qavvik	Gulo gulo	043
Ermine (Weasel)	Itigiaq	Mustela erminea	044
Wildfowl			050
Duck	Qaugak		051
Oldsquaw	Aaqhaaliq	Clangula hyemalis	052
Pintail	Kurugaq	Anas acuta	053
Mallard	Ivugasrugruk	Anas platyrhynchos	054
Red-breasted merganser	Aqpaqsruayuuq	Mergus serrator	055
Surf scoter	Aviluktuq	Melanitta perspicillata	056
Greater scaup	Qaqłuktuuq	Aythya marila	057
Eider			060
Common eider	Amauligrauq	Somateria mollissima	061
King eider	Qiŋalik	Somateria spectabilis	062

TABLE A-3 (cont.): BARROW SPECIES CODING LIST

Species	Iñupiaq Name	Scientific Name	Code
Spectacled eider	Tuutalluk	Somateria fischeri	063
Stellar's eider	Igniqauqtuq	Polysticta stelleri	064
Goose	Nigliq		066
Brant	Niġliñġaq	Branta bernicla n.	067
White-fronted goose	Nigliviuk	Anser albifrons	068
Lesser snow goose	Kaŋuq	Chen caerulescens	069
Canada goose	Iqsraġutilik	Branta canadensis	070
Emperor goose	Mitilugruak	Chen canagica	071
Murre			075
Common murre	Atpak (Atpa)	Uria aalge	076
Thickbilled murre	Atpatuuq	Uria lomvia	077
Loon			080
Arctic loon	Qaqsrauq	Gavia arctica	081
Common loon	Malġi	Gavia immer	082
Red Throated loon	Qaqsraupiagruk	Gavia stellata	083
Yellow billed loon (King bird)	Tuullik	Gavia adamsii	084
Ptarmigan			085
Rock ptarmigan	Niksaaktuŋiq	Lagopus mutus	086
Willow ptarmigan	Aqargiq	Lagopus lagopus	087
Snowy owl	Ukpik	Nyctea scandiaca	090
Sandhill crane	Tatirqaq	Grus canadensis	091
Tundra (Whistling) swan	Qugruk	Cygnus columbianus	092
Gull	Nauyak	Larus sp.	093
Black guillemot	Inagiq	Cepphus grylle	094
Fish			110
Salmon			111
Chum salmon	Iqalugruaq	Oncorhynchus keta	112
Pink (humpback) salmon	Amaqtuq	Oncorhynchus gorbuscha	113
Silver (coho) salmon	Iqalugruaq	Oncorhynchus kisutch	114
King (chinook) salmon		Oncorhynchus tshawytscha	115
Whitefish			120
Round whitefish	Aanaaliq	Prosopium cylindraceum	121
Broad whitefish	Aanaaliq	Coregonus nasus	122
River caught	Aanaaliq	Coregonus nasus	123
Lake caught	Aanaaliq	Coregonus nasus	124
Humpback whitefish	Piqutuuq	Coregonus clupeaformis	125
Least cisco	Iqalusaaq	Coregonus sardinella	126
Arctic, Bering cisco	Qaaktaq	Coregonus autumnalis	127
Capelin	Paŋmaksraq	Mallotus villosus	131
Arctic Grayling	Sulukpaugaq	Thymallus arcticus	137
Arctic char	Iqalukpik	Salvelinus alpinus	132

TABLE A-3 (cont.): BARROW SPECIES CODING LIST

Species	Iñupiaq Name	Scientific Name	Code
Arctic cod	Iqalugaq	Boreogadus saida	133
Burbot (Ling cod)	Tittaaliq	Lota lota	134
Tomcod (Saffron cod)	Uugaq	Eleginus gracilis	135
Arctic flounder	Nataaġnaq	Liopsetta glacialis	136
Northern pike	Siulik	Esox lucius	138
Sculpin	Kanayuq	Cottus cognatus	139
Rainbow smelt	Iłhuaġniq	Osmerus mordax	140
Lake trout	Iqalukpik	Salvelinus namaycush	142
Blackfish	Iłuuqiñiq	Dallia pectoralis	130
Invertebrates			150
Clams	Kiirauraq(iviluq)	Macoma calcerea	151
Tanner crab	Putyuun	Chionoecetes opilio	152
King crab	Puyyugiaq	Paralithodes platypus	153
Shrimp	Igliġaq	Pandalidae sp. & Cragonidae sp.	154
Berries			160
Blueberry	Asiaq	Vaccinium uliginosum	161
Cloudberry	Aqpik	Rabus chamaemorus	162
Cranberry	Kimmiŋñaq	Vaccinium vitis-idaea	163
Crowberry	Paungaq	Empetrum nigrum	164
Salmonberry	Aqpik	Rubus spectabilis	165
Bird Eggs	Mannik		170
Tern eggs			171
Gull eggs			172
Eider eggs			174
Forest/Vegetation			190
Alder bark	Nunaŋiak		191
Birch tree	Urgiiljiq		192
Willowbrush	Uqpik		193
Driftwood	Qiruk		194
Sod	Ivruq		195
Aspen	Nunaŋiak		196
Greens/Roots			200
Grass roots	Qalġaq		201
Hudson's Bay tea	Tilaaqiq	Ledum decum	202
Sourdock		Rumex archius	203
Swamp grass	Nakaat		204
Wild celery	Ikuusuq	Angelica lucida	205
Wild chives	Quaġaq	Allium schoenoprasum	206
Wild potato	Masu	Hedysarum alpinum	207
Wild rhubarb	Quŋulliq	Oxyric digyna	208
Wild spinach	Qauġaq	Rumex arcticus	209
Willow leaves	Akutuq	Salix sp.	210

TABLE A-3 (cont.): BARROW SPECIES CODING LIST

Species	Iñupiaq Name	Scientific Name	Code
Minerals			220
Clay	Qiku		221
Coal	Aluaq		222
Fine sand	Maġġaraaq		223
Gravel	Qaviaraaq		224
Water			230
Fresh water	Imiq		231
Fresh water ice	Sikutaq		232
Sea ice	Siku		233
Snow	Apun		234

Source: Stephen R. Braund & Associates, 1988

104

No. of Household Participants: A two digit numeric code representing the total number of household members present during the harvest documented by this record. In most instances, this value corresponds to the number of household harvesters above. However, for harvest activities that occur during an extended visit to a hunting or fishing camp (for which the majority of the family is in attendance) this value should represent the total number of household members present.

No. of Non-HH Participants: A two digit numeric code representing the number of non-household members present during the harvest documented by this harvest record. When recording whaling crew shares, the total number of crew member shares (minus the number of household harvesters) is noted in this column.

Comments: A string code of text with a maximum length of 156 printable characters (including spaces). Only comments directly related to the harvest record are coded here (e.g., an estimated size or measurement, names of participants).

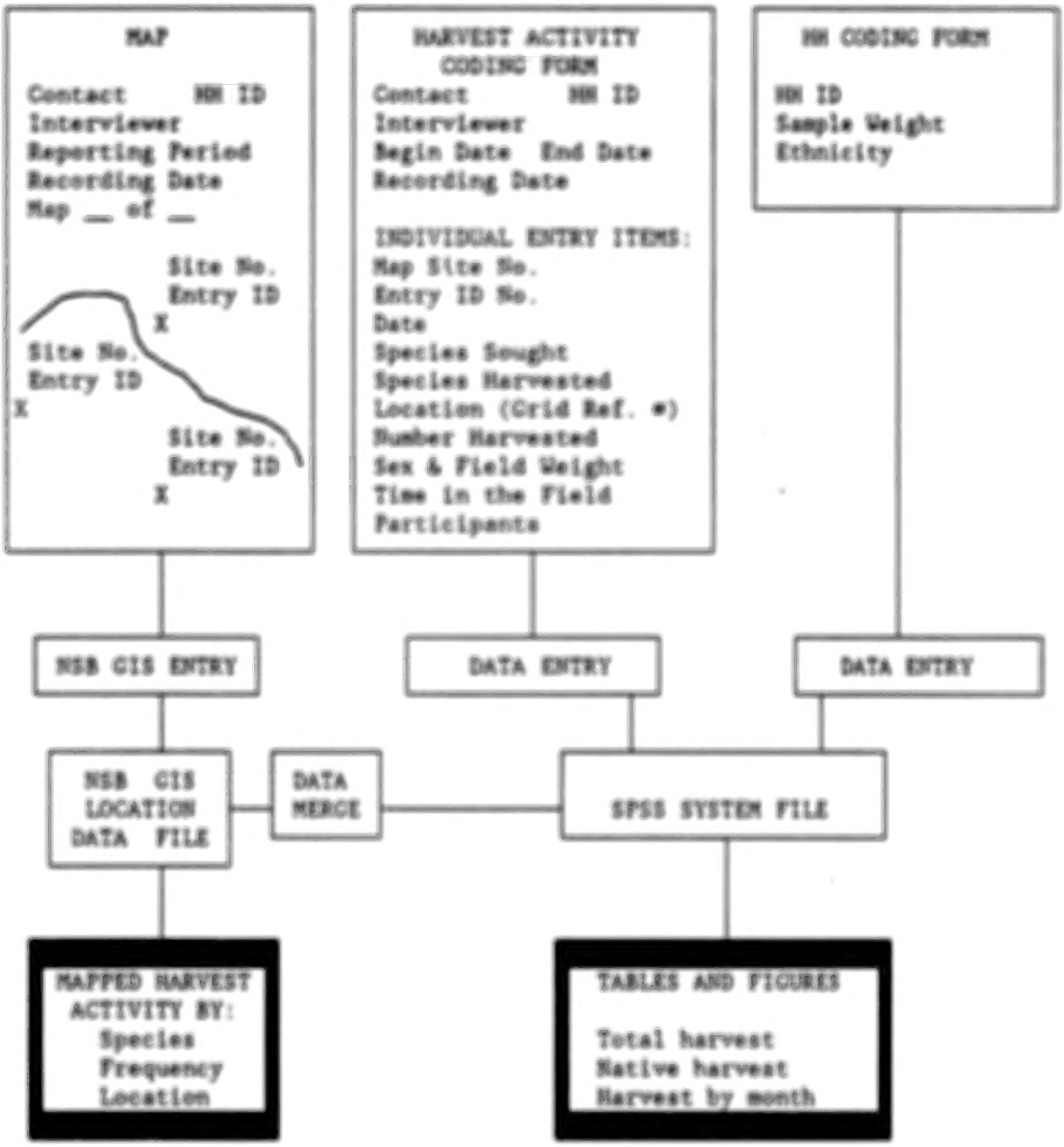
Data Processing

By maintaining stringent guidelines as to the format in which individual data items are coded for computer entry, the study team was able to statistically analyze data collected through key informant interviews.

SPSS/PC+ was the primary tool for data entry, organization, and analysis. A subset of the data was converted to an ASCII file and transferred to the GIS. This file included the entry identification number, species, and amount harvested for every resource harvest observation. Individual records in this file were matched with the digitized location already entered into the GIS using the entry identification number. Data in the GIS thus include entry identification number, species, amount harvested and a digitized location for each resource harvest observation. These data were sufficient to generate the maps of resource harvest activity by frequency of use and amount of harvest by location for each species.

Figure A-2 summarizes the transfer of data from fieldworker maps and harvest activity coding forms into the GIS and SPSS/PC+ data processing systems. After the necessary mapping data are transferred from the SPSS/PC+ file to the GIS the two data processing systems can operate independently. The GIS produced the mapped summaries of resource harvest activity. SPSS/PC+ was used to produce tabular summaries of resource harvest activity.

FIGURE A-2: SUMMARY OF DATA PROCESSING



Source: Stephen R. Braund & Associates, 1988

106

Conversions from Numbers to Pounds

The harvest data are presented as the number of animals harvested and edible pounds of resource product. The edible weights were selected as one reporting unit in order to provide the public with data that are easily compared with ADF&G data. The ADF&G has published the bulk of Alaska subsistence studies and the majority of their research is reported as edible (usable) pounds. One notable exception is the recent Kivalina study by Burch (1985), a consultant on this study. Burch (1985) discusses in detail the tremendous variations in what is considered by the harvesters and users as the edible weight of an animal. Burch mentions fish as an example of how edible weight varies significantly and that edible weight may be as high as 99 percent of live body weight (Burch 1985). The study team expressed similar cautions in our discussion of the Year One fish harvest data. Further research by the study team on the field weights of resources and on the variation in those weights during years two and three may result in a discussion of field weights in subsequent reports.

The edible weight conversions for each subsistence resource are listed in Table A-4. Fish harvests often required an additional conversion, an estimate of the number of fish per sack. For those fish harvests that were reported in number of sacks, the number of fish in a sack were computed as follows:

Fish Species	Iñupiaq Name	Number of Fish per Sack	
Whitefish (non-specified)		30	
Round whitefish	Aanaaliq	100	
Broad whitefish	Aanaaliq	50	
River caught	Aanaaliq	50	
Lake caught	Aanaaliq	25	
Humpback whitefish	Piqutuuq	50	
Least cisco	Iqalusaaq	100	
Bering, Arctic cisco	Qaaktaq	100	
Capelin	Paŋmaksraq	100	(per gallon pail)
Arctic grayling	Sulukpaugaq	90	

The bowhead whale weight is an average of the estimated edible weight of each of the seven whales harvested by Barrow in 1987 (Table A-5). The total edible pounds of bowhead whale harvested was calculated independently of the sample data used for estimating the harvest weight of each of the other species. The reasons for our unique treatment of bowhead, as well as the data collection techniques and assumptions about the edible weight of individual whales, are discussed below.

TABLE A-4: CONVERSION FACTORS[1]

Species	Iñupiaq Name	Edible Weight per Resource in Pounds
Marine Mammals		
Bearded seal	Ugruk	176.0
Ringed seal	Natchiq	42.0
Spotted seal	Qasigiaq	42.0
Bowhead whale	Aġviq	26,375.6[2]
Polar bear	Nanuq	496.0
Walrus	Aiviq	772.0
Terrestrial Mammals		
Caribou	Tuttu	117.0
Moose	Tuttuvak	500.0
Brown bear	Aklaq	100.0
Dall sheep	Imnaiq	99.0
Arctic fox (Blue)	Tiġiganniaq	0.0
Red fox (Cross, Silver)	Kayuqtuq	0.0
Porcupine	Qiŋaġluk	10.0[3]
Ground squirrel	Siksrik	0.4[4]
Wolverine	Qavvik	0.0
Fish		
Salmon (non-specified)		6.1[4]
Chum salmon	Iqalugruaq	6.1[4]
Pink (humpback) salmon	Amaqtuq	3.1
Silver (coho) salmon	Iqalugruaq	6.0[3]
King (chinook) salmon		18.0[3]
Whitefish (non-specified)		2.0[3]
Round whitefish	Aanaaliq	1.0
Broad whitefish	Aanaaliq	2.5
River caught	Aanaaliq	2.5
Lake caught	Aanaaliq	3.4[3]
Humpback whitefish	Piquktuuq	2.5
Least cisco	Iqalusaaq	1.0[3]
Bering, Arctic cisco	Qaaktaq	1.0[3]
Capelin	Paġmaksraq	0.2[3]
Arctic grayling	Sulukpaugaq	0.8[3]
Arctic char	Iqalukpik	2.8
Burbot (Ling cod)	Tittaaliq	4.0
Northern pike	Siulik	2.3[3]
Rainbow smelt	Ilhuaġniq	0.2[3]
Lake trout	Iqalukpik	4.0

108

TABLE A-4 (cont.): CONVERSION FACTORS[1]

Species	Iñupiaq Name	Edible Weight per Resource in Pounds
Birds		
Duck (non-specified)	Qaugak	1.5
Eider (non-specified)		1.5
Common eider	Amauligrauq	1.5
King eider	Qinalik	1.5
Spectacled eider	Tuutalluk	1.5
Goose (non-specified)	Niġliq	4.5
Brant	Niġliñġaq	3.0
White-fronted goose	Niġliviuk	4.5
Ptarmigan (non-specified)		0.7
Willow ptarmigan	Aqargiq	0.7
Other Resources		
Berries (non-specified)		1.0[5]
Blueberry	Asiaq	1.0[5]
Cranberry	Kimmiŋñaq	1.0[5]
Salmonberry	Aqpik	1.0[5]
Bird Eggs (non-specified)	Mannik	0.15
Eider eggs		0.15
Greens/Roots (non-specified)		1.0[5]
Wild rhubarb	Quŋulliq	1.0[5]
Water[6]		0.0
Fresh water	Imiq	0.0
Fresh water ice	Sikutaq	0.0
Sea ice	Siku	0.0

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1. Sources are ADF&G Division of Subsistence Community Profile Database for Nuiqsut and Kaktovik (1987) unless otherwise noted.
2. Whale conversion weight was computed by the study team from the mean total edible weight per whale of the seven whales harvested in Year One (see Table A-5).
3. Study team estimate.
4. Source: Pedersen 1988.
5. Measured in quarts.
6. Water is measured in gallons and ice is measured in sled loads. A sled load is estimated to equal 100 gallons of water.

TABLE A-5: 1987 BARROW BOWHEAD WHALE HARVEST, ESTIMATED TOTAL EDIBLE POUNDS PER WHALE

Date Harvested	Length	Number of Crewshares[1]	Average Crewshare Weight	Total Weight Nininat[2]	Total Weight Tavsi & Uati[3]	Total Edible Weight of Whale
5/1/87	30' 6"	39	266	10,374	6,916	17,290
5/2/87	29' 4"	30	275	8,250	5,500	13,750
5/4/87	36' 9"	36	339	12,204	8,136	20,340
5/20/87	55' 1"	12	905	10,860	4,199[4]	15,059
6/14/87	51' 4"	32	1,204	38,528	25,685	64,213
10/21/87	51' 3"	5[5] 11[5]	2,000 1,017	10,000 11,187	4,800[6] 5,370[6]	31,357
10/29/87	27' 10"	13	1,044	13,572	9,048	22,620
TOTAL:	n/a	178	7,050	114,975	69,654	184,029
AVERAGE:	40' 4"	25	1007	16,425	9950	26,376

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1. One crewshare is the total amount of whale allocated to one crew at the butcher site.

2. Nininat is the portion of the whale distributed to participating crews at the harvest site. The weight of the nininat shares was computed from crew share data collected for this study.

3. Of the tavsi portion, half is cooked and served to the public and the other half is distributed to the successful crew. The uati portion is stored by the successful captain and distributed at various feasts and celebrations throughout the year. Total tavsi and uati weights were estimated to equal 40 percent of total edible whale weight. This ratio was developed by SRB&A from whale weight data collected by the NSB Department of Wildlife Management (George et al., in press).

4. All the meat was spoiled from this whale. It was lost in high seas, then retrieved and butchered three days later. The estimated weight of tavsi and uati shares was reduced by 42 percent to account for no edible meat being harvested from this whale.

5. There were two sizes of crewshares for this whale, the larger being for those who participated in a lengthy and dangerous tow to shore.

6. Approximately one-half the meat was spoiled from this whale. A long tow and high surf on the beach delayed the butchering process. The estimated weight of tavsi and uati shares was reduced by 28 percent to account for slightly less than one-half of the meat being harvested from this whale.

Source: Stephen R. Braund & Associates, 1988

Although we easily determined the number of whales harvested by Barrow whaling crews, the study team anticipated that it would be difficult to accurately measure how many pounds of whale each study household received. To weigh each sample households' share was an impossible task and having the household members estimate the weight of their shares would be unreliable. Application of an assumed average weight of a share was also unreliable since the size of the whales harvested varied as did the number of crewshares distributed for each whale. Beginning with the first whale harvested, the study team weighed several crewshares (i.e., one crewshare is the total amount of whale allocated to one crew at the butcher site) from each whale, recorded the number of crews receiving a share, and recorded the number of individuals on each crew. This information was used as the primary basis for estimating the total number of pounds of whale taken off the ice. The study team also relied on NSB Wildlife Management Department whale weight data (George et al. in Press) to complete estimates of the edible portion of each whale.

While not used in the estimation of the edible whale weights, the study team did collect crew member share (i.e., an individual's allocation of a crewshare) data from each study household. Each share received was recorded along with a unique whale identification number. Household harvest records for whale were used to estimate the percentage of community participation in bowhead whale harvests rather than to estimate the amount of whale harvested. For the following reasons, these data were less reliable as a basis for estimating total whale harvest amount for the community than the independent approach of estimating the weight of all crewshares .

- Sample-derived estimates of total whale harvest are less reliable in part because the total harvest is based on only seven harvest events (i.e., whales). Chance variations in participation by sample households contribute to a substantial sampling error. When this is multiplied by large harvest shares, the community total can vary substantially by chance.

- The distribution of whale is a complex social and cultural process. One tradition observed during fieldwork for this study was that each household in an extended family often would store their shares together, usually in the family ice cellar at the parent's house. Individual households within that extended family would be unsure of the number or size of "their" individual shares.

- Unlike the harvest reports for all other species, the household harvest records for whale were necessarily incomplete because the study team commonly was gathering the whale harvest information from secondary sources (i.e., from individuals who may not have been present at the division of the whale). For example, some whaling crew members seldom left camp until the whaling season was over. In those cases family members would pick up their shares for them. Furthermore, usually only one crew member from a crew would travel to a whale harvest site to aid in the butchering. He would be the only "active" participant in the harvest for that crew.

- Finally, as discussed in more detail below, the crewshare distribution the day of the whale harvest is estimated at 60 percent of the total edible weight. The remaining 40 percent went to the successful captains and crews and the majority was distributed during at least six public events and feasts throughout the year. The amount distributed at each occasion was impossible to gauge during this study.

The bowhead harvest was characterized by extensive distribution and sharing throughout the year, with a major distribution in the form of crewshares occurring on the day of the harvest. This nininat portion generally is taken from the front half of the whale and divided into crewshares, with one crewshare going to each whaling crew that assisted in the capture, towing, and/or butchering of the whale. The shares were usually of equal size, although larger shares were sometimes given to crews that helped to capture and land the whale. Not all crews arrived to help with every whale and usually an extra share or two was set aside for those individuals who helped with the butchering but who were not members of whaling crews. The number of crewshares per whale varied from 12 to 39 in Year One (Table A-5). The study team measured and weighed these crewshares in an attempt to arrive at a valid weight for the edible portion of the nininat share of each whale.

The study team, with the aid of locally hired research assistants, weighed crewshares at various stages of the processing and distribution of the whale, depending upon circumstances. The first opportunity entailed weighing entire crewshares at the whale harvest site when the researchers were able to be there at the right moment. The amount of time between when the whale was divided into crewshares and when the crews were ready to haul them to their captain's house was very short. The weighing of entire crewshares often depended on available manpower and the study team cooperated with individuals from the NSB Department of Wildlife Management in weighing crew shares. Crewshare weights among the different whales harvested varied from 266 pounds to 2,000 pounds and averaged over 1,000 pounds (Table A-5).

The next opportunity was to weigh the shares at a whaling captain's house before his crew or family members had divided their crewshare into crew member shares. However, under ideal circumstances the study team weighed the crewshare immediately after it had been divided into crew member shares but before crew members had begun to take their shares home. The window of opportunity was also very brief. Finally, if not enough crewshare weights had been gathered for a particular whale, the researchers visited individual crew members' households to weigh their shares before those were distributed further or consumed.

Supplemental data required for the computation of total crewshare weights included the total number of crews receiving shares from each whale and the total number of crew members on each crew. Information on total crews per whale was obtained at the whale site by the researchers or from knowledgeable people who were present at the harvest. The researchers also asked each whaling captain how many crew members shares he divided his crewshare into and how many people were on his crew. In Year One, the average size of a crew was 12 members. As is illustrated in Table A-5, the number of crewshares for each whale was multiplied by the average crewshare weight to compute the estimated weight of the nininat share. The total nininat share for the entire community was 114,425 pounds.

The above discussion refers only to the nininat portion of the whale. The tavsi and uati shares comprised the remainder of the edible whale weight. Half of the tavsi was apportioned to the successful crew, while the other half was cooked and served to the public. The uati was stored by the successful captains and was distributed at a number of public events and feasts. Occasions for public sharing and distribution of whale in Year One included: a celebrative feast at the captain's house the day (or the day after) the harvest occurred; a feast on the beach when the successful crews formally brought their whaling boats off the ice; the Nalukataq celebration; Thanksgiving; Christmas; and Kivgiq (the messenger feast). Successful captains also were called upon to contribute whale for events and holiday celebrations taking place in other North Slope villages.

The study team obtained average weights for the tavsi and uati shares from the NSB Wildlife Management Department (George et al., in press). SRB&A worked in association with Craig George and Geoff Carroll and their staff to weigh these portions at two whale harvest sites in 1987. The study team used that data to develop a ratio of tavsi and uati to the total edible whale weight. The tavsi and uati shares combined equaled approximately 40 percent of the entire edible whale weight of the two whales. The study team used that standard percentage to compute the tavsi and uati weights for all seven whales.

There were two exceptions to the standard formula for determining tavsi and uati weight. All the meat from the whale harvested on May 20, 1987 spoiled and a portion of the meat from the whale harvested on October 21, 1987 also spoiled. The whale landed on May 20 had been killed but lost in rough seas three days earlier (May 17). Whaling crews searched daily until the whale was finally spotted by a pilot flying approximately 25 miles northeast of Barrow. By that time, the meat had spoiled completely. However, such whales (referred to as "stinkers") are usually harvested. Crews towed the whale to within four miles of town, landed it on the shorefast ice, and butchered the entire whale to salvage most of the maktak (skin and attached two inches of blubber). The whale harvested on October 21, 1987 was towed through the night and, with great difficulty, was landed on the beach in high surf conditions the next afternoon. Field observations indicated that approximately one-half the meat had spoiled. Although the nininat weights for these two whales reflect the actual weight of the shares received (i.e., they do not include the spoiled meat), the computed weight of the tavsi and uati shares was reduced somewhat because meat comprises a larger proportion of those shares. The tavsi and uati portions contain approximately twice as much meat as the nininat share (George et al., in press).

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MARCH 3, 1849

116

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